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RATING OF HARVESTER THRESHERS CASE 8120 AND NEW HOLLAND CX 8080

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Abstract: The aim of this work is to review the activity and quality of work of two different combines – CASE 8120 and New Holland CX 8080. The analysis of these two machines is focused on the amount of grain loss, the quality of chopping and spreading residue, the influence of humidity on the amount of grain loss, the influence of humidity on chopping and spreading residue, the power, fuel efficiency.

Either of these combines can be recommended based on the data obtained in this work, but the combine CASE 8120 is more powerful than New Holland. However in practice the difference can be seen only in the mass and area performance. No doubt it was caused by axial-flow treshing method which was used in CASE.

Key words: *harvester threshers, evaluation, technology, quality, brand*

INTRODUCTION

The first harvester threshers combine two major operations, reaping and threshing, are known as early as from the turn of the 19th and 20th centuries. For instance, the Moore´s combined reaper and threshing mechanism are known, patented as a whole in the year 1836. The first self-propelled hervester thresher was constructed by the American G. S.

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Berry. The machine was powered by two steam machines with a mutual boiler. To heat under it, the straw was used. The first self-propelled harvester thresher with petrol motor was developed in the year 1912 probably by G. F. Harris. The Massey-Harris company produced in the year 1922 the harvester thresher with an in-built motor and in the year 1938 the Massey-Ferguson company already produced its first self-propelled harvester thresher which was being sold with success. In the years 1910 to 1930, however, the towed machines were generally preferred, above all from economic reasons. During these years, the harvester threshers also spread throughout Europe. E. g. the Claas company produced in the year 1937 its first towed harvester thresher which was probably the first harvester thresher produced in the European continent. The self-propelled harvester thresher was produced by this firm in the year 1953[2].

In our countries, the first harvester threshers appeared after the year 1945. A tiny amount was imported from Western Europe, bigger distribution was, however, reached by the Soviet semi-trailer harvester thresher of S-6 type. In the year 1957, the self-propelled harvester threshers of S-4 type from the former USSR start to be used, as well as Hungarian machines ADC-343 of appropriately the same efficiency with diesel engine. From 1956 to 1957, Agrostroj Prostějov produces also the harvester thresher ŽM-330. At that time, a new type of harvester threshers from the USSR started to be imported, namely SK-3, which later replaced the SK-4 type. Since 1968, E-512 machines from the former German Democratic Republic have newly been imported to our country, which later became very popular and were probably imported in the biggest amount from all the harvester threshers sold in our country. Since 1974, also the SK-5 Niva and SK-6 Kolos types from the former USSR have also been imported. Since 1979, the harvester threshers E-516 from the former German Democratic Republic have been imported, which later become together with E-512 and E-514 the basic machines for the harvest of cereals used in our agriculture. Besides these, the Polish machines Bizon Z-056 and Z-060, the Romanian ones CP-12 Gloria at a mountain version and exceptionally others are used to a lesser extent. After the year 1989, almost all world producers of harvester threshers get to the republic sooner or later - Case, Claas, John Deere, MDW, Massey-Ferguson, New Holland, etc. [2].

The basic distribution of harvester threshers is realized according to the threshing, i.e. at tangential and axial one, possibly by combination of these systems, the so-called hybrid system. Both tangential as well as axial harvester threshers feature in our experiment. That is why we closer focus only on these two ways of threshing.

At the tangential harvester thresher, the proper threshing mechanism consist of a threshing drum (one or two), most often the threshing one, and a threshing concave. By passing of material between the threshing drum and concave, the crash of material and loosening of grain from ears take place. 70 to 90 % of fine threshed material gets through the threshing concave to the stepped grain pan, or at some types to a set of screw conveyors, in which way the fine threshed material is imported to the refining agent. Further follows the cylinder beater, which prevents from further drift of straw by the threshing drum and guides its flow to the shaker. At some types, the threshing concave is extended below the very cylinder beater, which provides an additional separation and helps a smooth flow of material. The straw, thanks to the movement of keys of shaker, moves away from the thresher. During movement, parallel layering and shaking takes place, in which way the rest of fine threshed material is loosened, which is brought through the refining agent. For the improvement of separation, various tedding mechanisms or drum with withdrawable fingers are placed above the shaker, which intend to secure complete separation of fine threshed material before the end of the shaker. The threshed material is imported to the refining agent which consist of air box and air flow from the blower. Here occurs the separation of wheat from chaff which moves away from the thresher of spikelets that come back by the carrier of spikelets for finishing the threshing. The refined grain is transported by the conveyor of grain to the bin [3].

Harvester threshers with axial threshing and separation mechanism differ a lot from the classical tangential ones. From the name it results that the threshing mechanism is placed in the harvester thresher in such a way that the material is obliged to move on during threshing in the direction of axis of the drum, i. e. axially. The inclined conveyor to which individual adaptors are connected is somewhat different, it tends to be shorter and generally smaller. The threshed material is transported from the inclined conveyor to the axial threshing and separation mechanism. Some producers placed in front of the proper axial also the tangential vaned robot which pulls the plant material out of the inclined conveyor and throws it quickly to the axial drum. By this way, the smooth and continuous flow of material is reached. Blades of the insertion screw together with the guide gib pull the threshed material in the gap between the rotating combined rotor and fixed threshing and separation covering. In the first part of the rotor, there is threshing between it and the concave, i. e. loosening of grain from ears. The cereal material rotates at the same time between the rotor and covering at a speed equal to approximately one third of circumference speed of the rotor and by means of guide gibs of covering of the axial rotor it is moved in the direction of the axis of rotation. In the second part of the mechanism there occurs separation of grain from straw (rough threshing). The diameter of the threshing concave can be at the whole length the same or graded, as e. g. at the harvester thresher John Dere 9880 STS. This construcion, while the concave is enlarged, enables the plant material to expand during the flow by the mechanism. The finger rotor of the separator uses in this way the system of pulling and loosening of grain from the plant material. In this way the winding of straw on the rotor is restricted and, on the other hand, this arrangement decreases the energy intensity. The straw passes further in the same way thanks to guide gibs from the mechanism away, most often to the crusher, and is spread to the width of advance of the harvester thresher [3].

The basic agricultural requirements for harvester threshers can be characterized in the following way:

- machines are destined for gathering of cereals, corn for grain, legumes, oilseeds, clover plants and grasses for seed, possibly other grain crops.
- the executed operations are: mowing of ground cover or gathering from rows, transportation of material to the threshing mechanism, its threshing, separation of rough and fine threshed material, transportation of seed to the bin and straw to the row or crushing and spreading of straw through the stubble field.
- the unmowed ground cover of cereals with grain yield of up to 10 $t \cdot ha^{-1}$, height of plants from 0.3 to 2.5 m. Humidity of grain of up to 30 %, humidity of straw of up to 40 %. Proportion of grain to straw from 1:0.8 to 1:2.5. Ground cover vertical as well as depressed (turbulent) to all directions [1].
- during swathing, the ground cover is mowed by front self-propelled windrower with the width of advance of 4 to 6 m. Width of row of 0.8 to 1.4 m, height of row of 0.2 to 0.6 m. The stalks are placed to the longitudinal axis of a row at the angle

of 15 to 25°. The row cannot be placed to the track of wheels. The quantity of ears for swathing in immediate touch with soil of up to 5 %.

- specific flow (permeability) at standard harvester threshers moves from 8 to 20 $kg \cdot s^{-1}$, which is corresponded by widths of advances of headers from 4 to 9 m, capacities of grain bins of up to 10 m^3 with filling height to the means of transport of over 3 m, engine powers of up to 300 kW, working speeds infinitely variable from 1 to 8 $km \cdot h^{-1}$ and productivities of up to 4 $ha \cdot h^{-1}$. Slope accessibility of 8 to 12°, pressure to the soil below 0.15 MPa.
- specific flow of slope harvester threshers is considered to be smaller and this is corresponded by widths of advances of headers, bins volumes, engines powers, work speeds and production rates. Slope accessibility of 20°, pressure to the soil below 0.15 MPa.
- standard as well as slope harvester threshers should have the possibility of being equipped with these adaptors with fitting: pick up mechanism for divided gathering, carrier-mounted crusher of straw, chassis for header, ar-conditioned cabine. Standard harvester threshers moreover: adaptor for gathering of corn for grain, adaptor for gathering of sunflower and rape.
- harvester threshers should have the following features of automatization: indication and signalling of losses of grain behind shakers and cleaning machine, indication of decline of nominal revolutions of the main shafts of working mechanisms, counting of hectares, slope threshers, and then automatic equalizing threshers in traverse as well as longitudinal direction at slopes up to 20°. Perspectively, standard harvester threshers should have: automatic guidance of machine to the grain wall, automatic regulation of traverse speed according to indicated losses of grain and according to permeability, automatic regulation of threshing mechanism, shakers and fining agent, mapping of yields.
- harvester threshers have to work with high operational reliability, must comply with regulations on safety and health protection during work, regulations on operation on public communications, possibly with regulations on transport by railway.
- the machine has to be attended by one worker
- regular height of stubble field, infinitely variable from 70 to 600 mm. Losses of grain during direct gathering of up to 1.5 % (specific from biological crop), from that behind the header of up to 0.5 %, behind the thresher of up to 1 %. Losses of grain during divided gathering of up to 2 %, from that after the withdrower of up to 0.5 %, behind the pick up mechanism of up to 0.5 % and behind the thresher of up to 1 %. Losses of grain from cylinder losses of up to 0.5 %. Damage of grain of up to 3 %. Content of cereal ingredients and impurities in a grain (in the bin) of up to 3 % (specific), from that of impurities of most highly up to 1 %. Width of a row of straw of up to 150 cm.

The harvest of seed crops, especially then of cereals and pulses, can at present only with difficulties be imagined without harvester threshers. These are complicated machines which develop all the time, their productivity increases, losses and operational costs decrease. The most important task which is required from harvester thresher is the separation of grain from straw by means of separation.

Wheat was harvested throught combine harvester or tresher. Labor shortage and timely completion of harvesting operation attracts farmers to harvest wheat crop throught combine harvester. This facilitates to make land available for next crop sowing operation. The damage loss of wheat grain is the main disadvantage of harvesting machinery utilization [5].

From the times of the first harvester threshers which were drawn by several pairs of horses, already a row of years passed, and that is why we at present commonly meet harvester threshers of the power of over 300 kW, the most efficient ones may dispose even of engines of the power exceeding 400 kW.

Today is also more and more frequently used GPS. It consists of three basic systems - the space segment, the control segment and the level of user segment [4]. Use this control system guides the combine harvester with an accuracy of up to 1-3 cm, or be drawn up yield and moisture maps.

MATERIALS AND METHODS

In the experiment, two harvester threshers were used – Case 8120 and New Holland CX 8080. The most detailed characteristic of individual machines is stated in Tabs 1 and 2.

Table 1. Technical specifications of harvester thresher New Holland CX 8080

Year of manufacture	*2007*	
Engine	*Iveco Cursor, 290 kW, volume of 9 litres*	
Cutter mechanism	*Biso, 750 cm*	
Threshing and separation mechanism	*Tangential threshing mechanism with rotating separator, 6 key shakers of the area of 5,93 m^2*	
Threshing drum	*Diameter [mm]*	*750*
	Width [mm]	*1560*
	Revolutions of threshing drum [min]	*305 - 905*
	Angle of wrapping of threshing basket [°]	*111*
	Area of the main threshing basket [m^2]	*1,18*
Area of sieves [m^2]	*6,5*	
Size of grain bin [l]	*10 500 l*	

Table 2. Technical specifications of harvester thresher Case 8120

Year of manufacture	*2010*	
Engine	*Iveco Cursor, 313 kW, volume of 10,3 litres*	
Cutter mechanism	*MacDon, 915 cm*	
Threshing and separation mechanism	*Axial, 1 rotor, hydraulic changeover*	
Threshing drum	*Diameter [mm]*	*762*
	Length [mm]	*2638*
	Revolutions of threshing drum [min]	*220 - 1180*
	Angle of wrapping of threshing basket [°]	*180° (360°)*
	Area of the main threshing basket [m^2]	*x*
Area of sieves [m^2]	*6,5*	
Size of grain bin [l]	*12 300 l*	

Ideal conditions, that is to say measurement at both harvester threshers on the same day at one field, when both harvester threshers would have the same conditions both as for the yield, weed infestation of ground cover, humidity, as for climatic conditions of the field, were not possible. The characteristic of fields and climatic conditions was chosen so that it suited the following:

- Crop: winter wheat
- Terrain: flat land
- Yield [Ø]: 6 - 7 t·ha^{-1}
- Grain humidity [Ø]: 12,5 - 13,5%
- Weather: clear, windlessness, 20 - 25°C
- Ground cover: depressed from max. 5%, minimal weed infestation

The consumption of harvester thresher can be found out according to the relationship (1):

$$m = \frac{O_l}{n_{ha}} \tag{1}$$

Where:
m [l·ha^{-1}] - consumption of PHM,
O_l [l] - volume of refilled fuel,
n_{ha} [ha] - harvested area.

The time of working engagement of machine will be found out by direct measurement and consists of definite partial categories of times. For our measurement, especially 4 times are important, according to which we find out 4 various performances – time T_1, for performance W_1 (effective). Time T_{02} for performance W_{02} (operational). Time T_{04}, for performance W_{04} (productive). Time T_{07} for performance W_{07} (general).

Distribution of times:
T_1 - major time
T_2 - incidental time (emptying of bin, rotation)
- $T_1 + T_2 = T_{02}$ = operational time

T_3 - time for maintenance
T_4 - time for clearing of faults
- $T_1 + T_2 + T_3 + T_4 = T_{04}$ = productive time

T_5 - time of idle times due to operation
T_6 - time for initiation and termination of SM work
T_7 - time of other idle times
- $T_1 + T_2 + T_3 + T_4 + T_5 + T_6 + T_7 = T_{07}$ = general time

The areal performance of harvester thresher can be found out from the area “P“ for the definite time “T“. Harvester threshers were monitored during working shift and times were recorded in time picture. We find out 4 kinds of performance – effective, operational, productive and general. Individual areal performances can be calculated according to equations (2),(3),(4),(5).

- Effective areal performance:

$$pW_1 = \frac{P}{T_1} \tag{2}$$

- Operational areal performance:

$$pW_{02} = \frac{P}{T_{02}} \tag{3}$$

- Productive areal performance :

$$pW_{04} = \frac{P}{T_{04}} \tag{4}$$

- General areal performance

$$pW_{07} = \frac{P}{T_{07}} \tag{5}$$

Where:

$pW_1, pW_{02}, pW_{04}, pW_{07}$	[$ha \cdot h^{-1}$]	- areal performance in given time interval,
P	[ha]	- processed area during measurement ,

Weight performance is understood to be the found weight of sample “V_z“ for a definite time “T“. Harvester threshers were monitored during working shift and times were recorded in time picture. As at areal performance, we find out also here 4 kinds of performance – effective, operational, productive and general. Individual weight performances can be found out by means of equations (6),(7),(8),(9).

- Effective weight performance:

$$mW_1 = \frac{m}{T_1} \tag{6}$$

- Operational weight performance:

$$mW_{02} = \frac{m}{T_{02}} \tag{7}$$

- Productive weight performance:

$$mW_{04} = \frac{m}{T_{04}} \tag{8}$$

- General weight performance:

$$mW_{07} = \frac{m}{T_{07}} \tag{9}$$

Where:

$mW_1, mW_{02}, mW_{04}, mW_{07}$	[$t \cdot h^{-1}$]	- weight performance in given time interval,
m	[t]	- weight of sample V_z during measurement ,
T_1	[h]	- major time,
T_{02}	[h]	- operational time,
T_{04}	[h]	- productive time,
T_{07}	[h]	- time of measurement in given time interval.

The quality of crushing of straw can be calculated from Eq. (10). For sampling we use the canvas which we place between front and rear wheels of the harvester thresher. To this area, we spread one more canvas in shape of rectangle of the length of cutter bar of the harvester thresher and of the width equal to specific area of $1m^2$. After driving of the harvester thresher to the ground cover, we carry the canvas for such a long time until the harvester thresher is completely fulfilled, then we put in down, place to it produced rectangle and let it drive over by rear wheels. The crusher of harvester thresher disperses for us consequently crushed after-harvest residues to the rectangle produced by us. Individual fractions separate, their measurement and evaluation are done. Consequently, individual fractions divide into individual classes according to straw length (0 - 5cm, 5,1 - 7,5cm, 7,6 - 10cm, 10,1 - 12,5cm, 12,6 - 15cm, 15,1 cm and more). The quality of crushing of straw can be found out according to Eq. (10).

$$K_d = \frac{f_i}{m_c} 100 \tag{10}$$

Where:
K_d [%] - percentage representation of individual classes,
f_i [g] - weight of individual fraction,
m_c [g] - total weight of after-harvest residues on the taking canvas .

Harvest losses can be found out in such a way that the checked area $K_{p2} = 1 m^2$ is defined perpendicularly to the row. The working engagement of lath is equal to the length of this rectangle, the width is calculated according to Eq. (11). From the checked rectangle, we can find out relative losses or absolute losses. It is necessary to remove from the control area all grains including the grains which are found in possible unthreshed ears.

$$w = \frac{K_{p2}}{d} \tag{11}$$

Where:
w [m] - width of rectangle,
d [m] - length of rectangle (according to cutter mechanism).

Total relative losses Z_{rc} are determined by calculation according to Eq. (12). Both before-harvest as well as harvest losses found out from the control area K_{p2} are concerned. The yield of grain (m_z) is the weight of grains in $kg \cdot ha^{-1}$, which is harvested by harvester thresher and is found out directly at the detector of harvester thresher.

$$Z_{rc} = \frac{m_{kp}}{m_z} \cdot 100 \tag{12}$$

Where:
Z_{rc} [%] - total relative losses,
m_{kp} [$kg \cdot m^{-2}$] - weight of grains from the control area K_{p2},
m_z [$kg \cdot ha^{-1}$] - yield of grain.

Calculation of relative losses of the harvester thresher Z_{rs} can be found out from formula (13).

$$Z_{rs} = \frac{(m_{ko} - m_p)}{m_z} \cdot 100 \tag{13}$$

Where:
Z_{rs} [%] - relative losses of harvester thresher,
m_{ko} [$kg \cdot ha^{-1}$] - weight of grains from the control area K_{p2},
m_p [$kg \cdot ha^{-1}$] - before-harvest losses,
m_z [$kg \cdot ha^{-1}$] - yield of grain.

RESULTS AND DISCUSSION

The performance of harvester thresher is one of the most important parameters which interests us as users. Areal and weight performance, as well as time picture are demonstrated in individual tables for individual harvester threshers.

Table 3. Time picture of harvester threshers during harvesting

Time	Case 8120 [h]	New Holland [h]
T_1	3,85	3,9
T_2	0,95	1,1
T_3	0,9	1,1
T_4	0,22	0,15
T_5	0,1	0,2
T_6	0,8	0,7
T_7	1,13	0,85
T_{02}	4,8	5
T_{04}	5,92	6,25
T_{07}	8	8

Weight performance of harvester threshers is demonstrated in Tab. 4.

Qualitatively cut straw usually contains 88-93% of particles smaller than 80 milimetres. The smaller the particles, the better they decompose in soil. Unsufficiently cut after-harvest residues result in longer decomposition time and in this way they enable the origin of undesired moulds, which can transfer to the succeeding crop. The quality of crushing at individual threshers is demonstrated in Fig. 1. The average humidity of material was in both cases of 13,2%.

Table 4. Weight performance of threshers during harvesting of winter wheat

	Case 8120 [$t \cdot h^{-1}$]	New Holland [$t \cdot h^{-1}$]
mW_1	75,71	68,21
mW_{02}	59,01	53,20
mW_{04}	47,24	42,56
mW_{07}	36,91	33,25

Areal performance of harvester threshers is demonstrated in Tab. 5.

Table 5. Areal performance of threshers during harvesting of winter wheat

	Case 8120 [$ha \cdot h^{-1}$]	New Holland CX [$ha \cdot h^{-1}$]
pW_1	9,96	8,97
pW_{02}	7,77	7,00
pW_{04}	6,22	5,60
pW_{07}	4,87	4,38

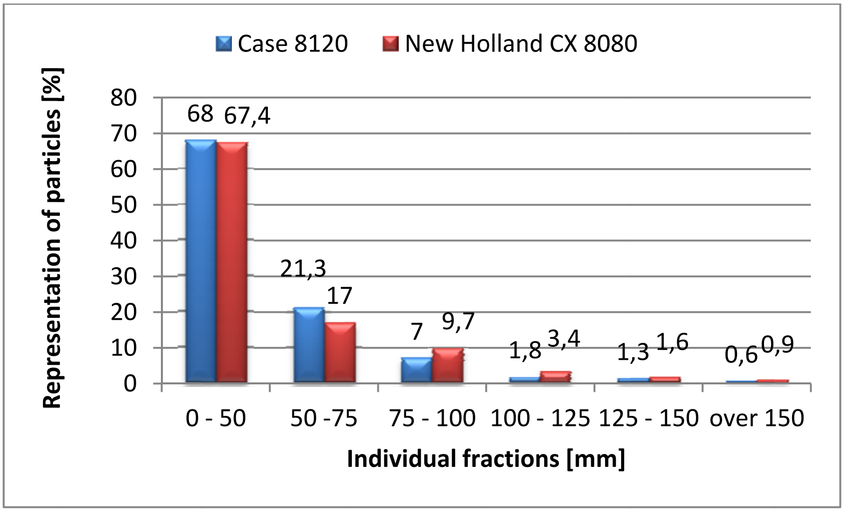

Figure 1. Percentage expression of quality of crushing of after-harvest residues at wheat

Size of absolute losses during harvesting of winter wheat is demonstrated at both harvester threshers in Tab. 6. The size of consumption of fuels is an important agent during calculation of costs for harvested hectare. The consumption of individual threshers is demonstrated in Tab. 7.

The fact, however, remains that there is tendency towards increasing of engine performance, notably at axial threshers. At present we commonly meet performances exceeding 400 kW. Almost everywhere these are machines with axial way of threshing. It is no exception that these harvester threshers have mowing adaptor of the advance exceeding 10 metres.

Table 6. Size of absolute losses at winter wheat

Harvester thresher	*Measurement*	*Size of harvest losses Z_{rc} [%]*
Case 8120	*harvesting of wheat*	*0,29*
New Holland CX	*harvesting of wheat*	*0,37*

Table 7. Size of consumption of fuels during mowing the wheat

Harvester thresher	*Consumption PHM [l.ha^{-1}]*
Case 8120	*17,9*
New Holland CX	*17,7*

I personally drive such machine and I think that with incresing advance decrease the crossings over the field, consequently also the consumed fuel. It is, however, necessary to consider the suitability of lands for such a cutter bar. Ideal conditions are undoubtedly in Southern Moravia or in Slovakia in the area of the Žitný island. Here the lanscape is practically flat. If the owner of the machine is, however, freelancer or firm dealing with services, it usually travels around all the state, many times also in more states. Then it is worth considering to buy a cutter bar which is smaller or invest money and buy a flexible mowing adaptor, e.g. of the MacDon company. I personally have only positive experience with this cutter bar. The disadvantage of this mowing adaptor is the price which moves around the double of classical mowing adaptor.

I do not recommend, however, bars with the advance bigger than 9,15 metres to tangential harvester threshers. These machines are not only sufficient by their performance, but mainly neither by their permeability of the whole threshing and separation system. In some cases, a bar at tangential threshers of the maximal advance of 7,5 metres is even recommended.

CONCLUSION

The harvester threshers, that is to say, did not operate on the same lands, the measurement, however, was realized in almost the same conditions (weather, terrain, yields).

By calculation of harvest losses, especially then of absolute losses, it was found out that the harvester thresher Case 8120 was doing better. Its losses moved up to 0,29 %, in comparison with the losses of New Holland, which were of 0,37 %. Both machines reached outstanding results as regards losses. The literature states the maximal permissible losses between 2 - 3%. The fact, however, remains that the extension of losses results from the crop being harvested and many times also from the concrete type of seed. The biggest share in losses will always have, however, the operation of harvester thresher. The setting of machine is different for every crop, humidity and sometimes also directly for the strain, and it requires maximal effort.

One of the most important factors is the performance of the harvester thresher. Both in weight performance as well as in the areal one, the harvester thresher Case 8120 was again doing better, harvesting 36,91 $t{\cdot}h^{-1}$, that is to say 4,87 $ha{\cdot}h^{-1}$. New Holland harvested 33,25 $t{\cdot}h^{-1}$, that is to say 4,38 $ha{\cdot}h^{-1}$.

During crushing and cutting the straw, the harvester threshers were virtually equal. The quality of crushing, demonstrated in picture 1, indeed marks as better the harvester thresher Case, nevertheless both of them met the criterion so that 80% of cut straw ranged between 0 - 80 mm.

The consumption of fuels was at both machines virtually equal. By 0,2 $l{\cdot}ha^{-1}$ it was better at the harvester thresher New Holland, where the consumption of 17,7 $l{\cdot}ha^{-1}$, in comparison with 17,9 $l{\cdot}ha^{-1}$ at the harvester thresher Case, was reached. In practice it is, however, valid that the bigger is the yield of the field, the bigger the consumption. In case of our experiment, the field treated was always that of winter wheat of the yield over 7 $t{\cdot}ha^{-1}$. In case of harvesting the rape of the average yield of 2,5 $t{\cdot}ha^{-1}$, the consumption lower by 2 - 4 litres can be regarded. Also in this case, the yield and climatic conditions matter. Also the width of the header should be taken into this account.

The harvester threshers Case and New Holland met all agrotechnical characteristics from the point of view of losses, performance and quality of crushing of after-harvest residues. During harvesting, the harvester thresher by the Case company proved totally as better. The differences were, however, minimal at both products.

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OCENA RADA KOMBAJNA CASE 8120 I NEW HOLLAND CX 8080

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***Sažetak*:** Cilj ovog rada je da analizira rad i kvalitet rada dva različita kombajna – CASE 8120 i New Holland CX 8080. Analiza ove dve mašine je usmerena na količinu gubitaka zrna, kvalitet seckanja i rasturanja ostataka, uticaj vlažnosti na količinu gubitaka zrna, uticaj vlažnosti na seckanje i rasturanje ostataka, snagu i efikasnost potrošnje goriva.

Na osnovu rezultata ovog rada, oba kombajna se mogu preporučiti, ali kombajn CASE 8120 ima veću snagu od kombajna New Holland. Pored toga, u praksi se razlika može primetiti samo u performansama mase i vazdušne struje. Nema sumnje da je uzrok bila vršidba metodom aksijalnog toka, koja se koristi kod kombajna CASE.

Ključne reči: *kombajni, ocena, tehnologija, kvalitet, robna marka*

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