The Experimentation of the TC 5050 New Holland Combine Harvester in Sunflower Crop Harvesting

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Abstract. The work presents the results of laboratory experiments and field studies in sunflower crop harvesting with the New Holland TC 5050 combine harvester. The combine’s harvesting performance was monitored on the level and slope field by determining the work quality indexes and the energetic and operating indexes of the combine studied. When driving on sloping land on the valley -hill direction, grain losses have exceeded the maximum allowable limit, reaching values over 6,5%. When movement was along level curves, the grain loss had registered values close to maximum allowed limit (3%), being therefore the recommended method. Fuel consumption has increased considerably when driving on sloping land compared with driving on the level field. In order to achieve a quality harvesting work, combine harvesters should be adjusted and operated in accordance with land condition and with the agrobiological characteristics of the crops.

Keywords: combine harvester, sunflower, seed losses, fuel consumption.

Introduction. The straw grains combine harvesters are complex agricultural machinery capable to perform all the technological stages that are needed to obtain the main product (grains). It should be noted that even if those machines were initially designed only for mechanized harvesting of the straw grains, over the years they have been gradually equipped with new working boddies in order to harvest other crops: maize, sunflower, soybean, rapeseed, beans, peas, etc (Neculaiaasa V., 2002).

Aims and objectives. This paper aims to identify the optimum operating procedures for harvesting sunflower according to the land condition and to highlight the links and the relationship between the work quality, energetic and operating indexes. This paper studies the performance of the TC 5050 New Holland combine in sunflower harvesting on the level and slope land. A special attention should be paid to the level of seed losses, which tend to be very high when harvesting is done on slopping fields.

Materials and methods. The experimental research took place in 2011 at the Ezăreni Farm, which belongs to the University of Agricultural Sciences and Veterinary Medicine "Ion Ionescu de la Brad" Iaşi, on plots with sunflower hybrid Cobalt MK. Operating measurements were conducted under normal poduction conditions. The plots on which the experiments took place had shapes and sizes that would ensure the mechanized harvesting. The grain moisture at harvest was within the regulatory limit of 10-13%.

The work quality indexes, the energetic and operating indexes of the TC 5050 New Holland combine in sunflower harvesting were measured. The combine used in experimental research was the TC 5050 New Holland combine, equipped with header for harvesting sunflower with four work sections.

Daily stages of the combine working process were photographed and daily worksheets have been prepared. In those particular sheets were recorded the following: the experiments’ location, the crop, the time when the work has started, the operations and the duration of each operation, the time of completion the work, the plot’s draw and the plot’s
area which have been harvested, the quantity of the grains harvested, the cutting height, the fuel consumption and the grain moisture.

The combine was tested in operation conditions on the level and slope land: on the hill-valley direction, the valley-hill direction and along the contour, in first gear and the second gear. For each gear were used rotation speeds of 1500 rpm and of 1800 rpm and for each rotation speed, a number of three repetitions were done (Corduneanu I., 1977). In the experimental research were also used: metric frame, electronic scale, moisture meter, tilt to collect grains and vegetal residues, plastic bags to collect the grain samples, stopwatch, daily monitoring sheets. The working capacities have been measured and calculated on a 8 hours shift, at a normal working combines’ speed, which provided an optimal feeding flow, specific to each combine (Neagu V., Şandru A., 2004).

Results and Discussion. The work quality indexes were calculated according to the land’s slope, to the combine’s movement direction and to the combine’s speed.

When driving on sloping land on the hill-valley direction and on the valley-hill direction, the grain losses have exceeded the maximum allowable limit, reaching values over 6.5%. When movement was along the contour, grain losses have been close to the maximum allowable limit (2%).

The purity of the grains was very high when the combine’s movement was on the level land, but fell below the minimum allowable limit of 98% when combine’s movement was on the slope field, reaching values below 94%.

The operating indexes of the combines tested were calculated based on the timing sheets prepared during the operating experiments.

The values of the main operating coefficients of the TC 5050 New Holland combine were: the operational safety coefficient 0.81; the technological safety coefficient 0.97; the technical safety coefficient 0.88; the turns coefficient 0.94.

The hourly work capacity on shift time of the TC 5050 New Holland combine has recorded a decrease on average by 13-20% at harvesting on sloping land compared to on the level land harvesting, due to the slope, which reduced working speed by 18-29% which led to a decrease of the shift time usage coefficient to 0.53.

The fuel consumption of the TC 5050 New Holland combine obtained in sunflower harvesting on the sloping land has increased on average by 17-28% comparing to the fuel consumption obtained on the level land movement.

Conclusion. The percentage of broken grains was reverse proportional to the speed of the combine and has not been explicitly influenced by the slope. The percentage of broken grains showed higher values when the combine have been driven at lower speeds, due to the weak flow of grains which have been feeding the threshing apparatus. During the experimental research, we have seen that the combine’s safety is not ensured on the hill-valley movement balance facing valley, especially on slopes above 22% and when the bunker has a load over 1500 kg of grains. The time for technical fixes has immobilized the combine 18-22 min./shift on average, which drew reduction of the shift time usage coefficient to 0.53, and the operational safety coefficient to 0.81.

REFERENCES