Improving combine harvesters management through CAN-BUS data analysis

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**Abstract.**

In a global market, where the prices of agricultural commodities are so volatile and the prices of the inputs increase, it is very difficult for farmers and agricultural contractors to obtain at the end of the agricultural season a consolidated profit.

To help them to achieve this aim, over the years the agricultural manufacturers have designed increasingly efficient agricultural machinery in terms of capacity and reliability, but this solution is not sufficient. It is also important to carefully plan the actual usage of the machines, for example in the case of harvesting, where the harvesting time must be optimised in order to reduce the waste of time and input that at the end could increase the costs. The aim of this study is to evaluate the operational efficiency and energy performance of two selected combine harvesters, during harvesting time, and provide to farmers and contractors information that help them to make operational and economically informed decisions regarding optimal fleet management during harvesting time, in order to reduce the harvesting costs and sustain overall profit.

The data for the study was acquired as CAN-BUS data, from two New Holland harvester combines, operating in real world condition, during harvesting season 2020 in the Province of Bologna (Italy). The data was analysed, by using the MATLAB® suite, to obtain information about fuel consumption [l·ha-1], operational capability [ha·h-1], yield per field [t·ha-1], worked area [ha] and operational state identification.

The results show that the harvesters spent about 20% of their time in the idle operating state, about 66% of the time on actual harvesting and about 7% of the time on in-field transport, the 2% of the time for road transport, about 6% of time on unloading and less than 1% of the time on harvesting and unloading contemporarily. The large amount of time spent in the idle state instead on harvesting, potentially depend on inadequate work planning, especially the planning of the transport logistics, which forced the combines to halt operation several times. The sum of these forced stops, inevitably impact the overall cost of harvesting and on the operational capability, and this causing increased harvesting costs and a reduction of the end-of-year revenues for farmers and contractors.