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AN ERGONOMIC APPROACH FOR FRONT FOLDABLE ROPS FITTED ON AGRICULTURAL TRACTORS

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Key words: Tractor, Rollover, Foldable ROPS, Manual handling, Grasping area.

Tractor rollover is one of the main causes of fatal accidents in agriculture. Driver's injuries increase considerably if the Roll-Over Protective Structure (ROPS), designed to provide a clearance zone for the driver in the event of tractor rollover, is not correctly fitted on the tractor and used properly during normal field operations. Front-mounted folding ROPSs are widely used on narrow-track tractors because a front foldable ROPS makes the tractor more versatile than a cabin tractor for orchard and vineyard use, allowing it to better adapt to a reduced clearance area in the crop inter-rows. Front ROPS was conceived to be used in the upright position for driver protection in the case of unstable tractor conditions; nonetheless, to use the tractor in narrow spaces the driver is allowed to lower the ROPS only when strictly necessary and in safe conditions with respect to a rollover risk. Folding down the ROPS could be an essential operation for operating in specific conditions such as greenhouses or specially trained vineyards. Lowering and raising the ROPS is a manual operation normally performed by the driver with effects on the working capacity of the tractor since additional time is needed for this. The manual handling of the foldable ROPS, often difficult due to its heavy mass, is considered a potential cause of incorrect ROPS use, being left in the lowered position during the normal tractor operation and consequently with a lack of protection for the driver in the event of rollover. A feasible approach to encourage the correct use of the foldable ROPS is to assist the driver in handling the ROPS, allowing quick folding and raising actions, with efforts suitable for a medium-sized person. A test panel, mainly composed of skilled drivers, was selected to perform an evaluation on five tractors fitted with front foldable ROPS to analyse the ROPS handling with the aim of obtaining feedback allowing the design of foldable ROPSs to be improved in terms of easier, quicker and safer handling.

AMACA: AGRICULTURAL MACHINE COST ANALYSIS APP

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Key words: agricultural machinery costs, agricultural mobile app, agricultural operation cost.

Machinery and equipment are major cost items in farm businesses since many years in different countries. In the last years, moreover, high power machines, new technologies, higher prices for spare parts and energy contributed to the rising of the machines costs. The possibility to know in advance such costs is strategic for the farmers, but the agricultural machine cost determination available by internet applications are lacking of a mobile app. Aim of this work is to fill this gap with an easy to use mobile app, to determine the real machineries costs in different field operations and makes them available via web mobile application using a cross-platform approach. This paper describes the features of the web mobile app AMACA (Agricultural Machine App Cost Analysis) created by the authors using HTML language for the content, JavaScript for the logic part and CSS as a presentation style. To accelerate the development, the jQuery Mobile (JQM), a touch-optimized JavaScript library, was used. AMACA allows the analysis of traction costs and operation costs. The tool is free, readily available and does not need any installation on the end users devices. The tool was presented at service companies in agriculture, and people liked its features (mobile availability, easy of use, email parameters and results, easy cost calculation).

EVALUATION OF A TOWED OVER-THE-ROW HARVESTER FOR SUPER HIGH-DENSITY OLIVE GROVES

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Key words: towed over the row harvester, super high density olive groves, harvesting efficiency.

Actually the fruit farming techniques tend towards the crop intensification, increasing the plant density and reducing the size of the trees. This development is driven by some main factors as the varietal innovation, new types of training systems, the employment of irrigation and especially the mechanical harvesting. The reasons for this general trend of fruit farming systems are based on the labor costs reduction, thanks to the mechanization of cultivation operations joined to the workplaces safety increase. Among the olive field operations the harvesting is the second most expensive of the entire crop cycle, after pruning, so the mechanization of it is critical to the profitability of the olive. In high-density olive groves (super-intensive), the mechanical harvesting continuously with self-propelled straddle machines is carry out, which allow a significant increase in labor productivity amounted to 1800-3000 kg/h-worker. In fact the entire operation is realized by two workers, one driving the straddle harvester and the other one picking the olives to the harvesting zone, allowing to collect a hectare in 2 hours. Furthermore, the mechanical harvesting continuously in high density olive grove systems allowing to achieve the mains objectives of mechanization: maximum harvesting output; minimal damage to the fruits and vegetation; Minimum total cost. The unit cost of harvesting may reach an incidence of 0.03 € per kg of oil extracted, clearly less value even than the cost incidence of mechanical harvesting with trunk shaker with umbrella, considered for the olive intensive cultivation the best management solution. This paper reports the results of tests carried out in a super-intensive olive grove with an innovative harvesting machine manufactured by Pellenc company, CV5045: the harvesting module is not mounted on a self-propelled structure, as with commonly used machines in super-intensive olive groves, but on a special trolley towed. So, this machine requires a tractor of adequate power for its displacement and for the feeding of hydraulic control and electrical devices necessary for the operation (shakers groups, conveyor, proximity probes, etc.). The tests conducted with the tractor NEW HOLLAND T7 210, showed that the harvesting efficiencies is in line with those obtained with the self-propelled straddle, next to 97-98%, then higher than those reported for intensive installations in which the harvest is realized with olive harvester shakers, tree shaker with umbrella (95%) and single cone (91%). Moreover, the damage observed on the trees due to the machine harvesting operations, expressed in percentages of broken vegetative axes, were approximately 1.2%, similar to shaker harvester (1.1%). The self-propelled model, on the other hand, with the driver's cab and the collection module integrated into a single structure allows a high maneuverability of the vehicle during the harvesting operations. The model driven, instead, coupled to tractor and governed by hydraulic devices, that control the alignment with respect to the soil and vegetation, has a less easy maneuverability and requires considerable experience and attention of the tractor driver.