The ground pressure exerted by the tractors in the last five decades

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**Keywords.** contact area, soil compaction, soil degradation, soil protection, tractor tyres.

**Abstract.** Currently, the potential serious consequences of the impact of agricultural machines on the soil are increasingly known. As the soil is and will be the main commodity for food production, the issues of prevention, conservation and restoration of the "health" of agricultural soils are extremely paramount. Soil compaction is one of the eight factors causing soil degradation, according to the EU “Strategy for soil protection”. During the last five decades, soil compaction was caused by the traffic of agricultural machines having increasingly higher power and weight. In order to reduce the soil compaction caused by the traffic of agricultural machines, the type of tyres and their inflation pressure should be carefully selected. The mean ground pressure can be quickly and accurately estimated for several combinations of tractor weight/tyres, in order to evaluate the possibility of soil compaction. The aim of this study is to evaluate the anthropogenic and technogenic impact of agricultural tractors on the soil during the last five decades (i.e. from 1971 to 2021). In fact, the negative impact of both wheeled and tracked agricultural machines on the soil and its causes, taking into account the design features of tractor propulsion organs (i.e. tyres and tracks), is described in this work. Data such as the construction year, manufacturer, model, power, total weight, weight (load) on the front and rear axle, wheelbase, types of front and rear tyres, as well as tyre specifications, were collected. The main indicators of the negative impact of the tractors manufactured during the last 50 years on the soil, i.e. the average and maximum pressure of their propulsion organs on the soil itself, were computed and the mean pressure applied by each tractor onto the soil was calculated. The results show that during the specified periods: 1) the average power increased and the production of 2WD tractors highly decreased; 2) the weight/power ratio decreased from 70 to 60 dN/kW; 3) most tractors were fitted with cross-ply tyres during the 1970s, while almost all tractors are nowadays fitted with radial tyres having aspect ratio lower than 85% and even reaching 65%; 4) the average ground pressure increased, especially for tractors having power higher than 100 kW. Therefore, these results show that tractor manufacturers did not take care of reducing soil compaction during the above period. Therefore, manufacturers must pay more attention to designing machines not exceeding the limit of 0.1 MPa (low soil compaction), by decreasing the loads and/or increasing the soil contact area.