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## First tests on universal tractor transmission oil (UTTO) bio-based lubricants for the transmission and the hydraulic system of agricultural tractors

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Bio-based products are recently increasing importance in consideration due to their compatibility with the new global directives on circular economy and sustainability. Agricultural processes are deeply involved in these concepts both as producer of building blocks for industrial bio-based products and as a consumer of such products in the farming/forestry/ livestock productive practices. Among bio-based products, lubricants could play an important role consider the high quantitative mineral lubricants as they could potentially replace world-wide. In recent years, a process has been started to produce from high-oleic vegetable oils, lubricants and hydraulic fluids with good tribological properties, high biodegradability and low toxicity. Nevertheless, their utilization in agricultural machines is a delicate process. The heavy-duty tasks those machines have to accomplish and there is a need for a series of experimental steps aimed at verifying that the bio-based lubricants characteristics are atleast equivalent to those of the mineral fluids to be replaced. Lubricant's typical parameters (i.e.,

viscosity, acidity, flash point, pour point, etc.) and their technical performance (i.e. energy dissipated as heat, fluid lifetime) have to be assessed for renewable lubricants with standard analyses and purpose designed accelerated life trials. A first series of test was carried out at CREA-Ingegneria e Trasformazioni Agroalimentari, Monterotondo, Rome, Italy research center with the aim of comparing the performances provided by agricultural tractors operating with traditional fluids and with bio-based ones in their transmission hydraulic system. The tests meant to investigate any differences in tractor's performances attributable to the fluids. The results, although not generalizable, allowed to focus some basic aspects of the evaluation of these products and to identify some methodological approaches mainly based on the comparison of fluids that undergo repeatable working cycles and the observation of the evolution of their characteristics by means of periodic samplings of the fluids and laboratory analyses.

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