Stability of Agricultural UGV prototype

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**Abstract.** The work aims to evaluate the stability of an Unmanned Ground Vehicle (UGV) prototype, developed by the University of Bologna for precision orchard and vineyard management. The peculiarity of the machine is in the driving part moving autonomously in the field combined to a tank to store water and pesticide mixture for crop protection together with an additional structure to carry agricultural implements. The study concerned evaluating the stability of the agricultural UGV without implements and mounted with a mulcher and a sprayer. In the case of the sprayer, the stability behavior was evaluated with empty and full tank. Stability has been studied both laterally and longitudinally to the machine. A theoretical model was developed based on the upstream side forces measured during experimental tipping tests. The results of the experimental data were compared with the theoretical predicted results to validate the model. The results of the model were statistically correlate (R2>95). The results obtained showed that the most stable condition occurs was the case of UGV fitted with mulcher in longitudinal tipping position, while the most unstable condition was the case of naked UGV always in the longitudinal tipping. The stability angle was in between 40 and 56 degrees. Although the stability problem is not directly connected with the operator, as these machines do not require a driver, the lack of stability can lead to the UGV overturning with consequent problems for the surrounding environment and for the UGV itself.