

## Net traction ratio prediction for high-lug agricultural tyre

### ABSTRACT

A study was conducted to determine the accuracy of Wismer-Luth and Brixius equations in predicting net traction ratio of a high-lug agricultural tyre. The tyre was tested on a sandy clay loam soil in an indoor University Putra Malaysia (UPM) tyre traction testing facility. The experiment was conducted by running the tyre in driving mode. A total of 126 test runs were conducted in a combination consisting of three selected inflation pressures (i.e., 166, 193 and 221 kPa) and two wheel numerics (i.e., 19 and 29) representing two extreme types of soil strength under different levels of travel reduction ranging between 0% and 40%. Regression analysis was conducted to determine the prediction equation describing the tyre torque ratio. Marquardt's method used by Wismer-Luth for predicting non-linear equation was not found suitable in predicting the torque ratio of the test tyre owing its low coefficient of determination and inadequacy. The logarithmic model was found suitable in torque ratio prediction. From analysis of covariance (ANCOVA) the mean effect of travel speed, tyre inflation pressure and wheel numeric on tyre net traction ratio were found to be highly significant, while the interaction of inflation pressure and wheel numeric was not significant. The 193 kPa inflation pressure was found the best, among the three inflation pressures used, in getting higher net traction ratio and higher maximum efficiency. Finally, two models were formulated for tyre net traction ratio; one in terms of wheel numeric and travel speed reduction and the other in terms of mobility number and travel reduction, to describe the tested tyre performance at different soil strengths.

**Keyword:** Tyre, Traction, Efficiency, Inflation pressure, Penetrometer