Tropentag, September 17-19, 2018, Ghent

"Global food security and food safety:
The role of universities"

Mechanisation in Oil Palm Plantations: Effects of Tractor Passages and Manuring on Soil Physical Properties

Enoma Osarobo[1], Reinout Impens[2], Joseph Chokor[3]

[1] *University of Benin, Department of Soil and Land Management,*
[2] *Ghent University, Dept. of Plant Production - Lab. for Tropical Agronomy, Belgium*
[3] *University of Benin, Department of Soil and Land Management,*

Abstract

The oil palm (*Elaeis guineensis* Jacq.) is the major source of vegetable oil and production costs are usually well below that of other oil crops because of high yield potential of up to 8 tons of oil per hectare. However, labour requirements are comparatively high and increasing labour productivity through mechanisation is essential to guarantee the future competitiveness and sustainability of the industry. This involves the repeated use of agricultural machines for operations such as fertiliser application and fruit collection but brings with it a risk of soil degradation through compaction along the tracks. This is particularly relevant considering that with a crop cycle of 25 years remediation options are limited.

This paper presents the results of field work carried out on a mature oil palm plantation in Nigeria. Soil physical parameters (bulk density, porosity and penetrometer resistance) were measured at different depth on a control and after 1, 5, 10, 15 and 20 passes of a tractor with loaded lorry. The water infiltration and the water retention curve were determined after all the passes as well and compared to a control. 2 treatments scenarios were compared: With application of organic mill waste (OM+) during the first passes and without (OM-).

Soil bulk density and penetrometer resistance always increased with repeated tractor passes whereas porosity decreased and this affected all the soil layers considered (up to 50 cm deep). The effect was significant from 5 or more passes but the bulk density didn't increase more beyond 15 passes. Overall there was no significant effect from the application of organic mill waste; possibly because the trial duration was too short to allow for proper decomposition. Soil bulk density reached up to 1.8 g/cm^3 in cases with more than 10 tractor passes.

To know the impact on production one must take into consideration that only a fraction of the area available to each tree (10 %) is affected by tractor passes and more studies are needed to assess the impact of soil compaction on growth, development and production of the crop.

Keywords: Bulk density, oil palm, porosity, soil compaction, tractor passes, water retention

Contact Address: Reinout Impens, Ghent University, Dept. of Plant Production - Lab. for Tropical Agronomy, Ghent, Belgium, e-mail: Reinout.Impens@UGent.be