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Sustainable Management of Soil in Oil Palm Plantings

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Does the oil palm root system uniformly distribute in standard plantation?

Christophe Jourdan¹, Hervé N.S. Aholoukpè²,
Pujianto³, Jean-Pierre Caliman³

Abstract

Despite their importance for plant production, estimations of below-ground biomass and its distribution in the soil of an oil palm plantation are still difficult and time-consuming to make, and no single reliable methodology is available for different root types. Moreover, soil organic matter distribution may vary within a plantation depending on the management of pruned fronds and the distribution pattern of frond piles. In order to characterise root distribution within oil palm plantations, two sampling methods based on different soil sampling volumes were tested in Indonesia (Libo, Sumatra) and West Africa (Pobè, Benin): auger (8 cm in diameter), simplified Voronoi trench (2.7 m³) and a full Voronoi trench (5.8 m³), chosen as the reference method. Results indicated that the auger method underestimated root biomass estimation by 4% and 53% compared with the Voronoi method in 2- and 17-year-old plantations, respectively. The simplified Voronoi method is proposed to estimate root biomass in field conditions. Results also showed a significant ($p < 0.001$) positive correlation of root biomass and root length density to nutrient and soil organic matter content when we compared frond pile areas and frond-free pile inter-row. The impacts were significant for coarse and fine roots in Indonesia and for fine roots only in Benin. Moreover, these effects were observed mainly in the first 20 cm of soil and decreased thereafter with increasing soil depth and distance to frond piles. Recycling pruned leaves in the oil palm plantation promoted a significant development of roots and provided benefits to the oil palm for water and nutrient supply.

¹ CIRAD, UMR Eco&Sols, F-34060 Montpellier, France. Email: christophe.jourdan@cirad.fr

² Centre de Recherches Agricoles Plantes Pérennes, INRAB, BP 01 Pobè, Benin.
Email: aholoukpeherve@yahoo.fr

³ PT SMART Research Institute (SMARTRI), Riau, Indonesia. Email: caliman@indo.net.id