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Root Distribution of Mature Oil Palms in Mineral and Peat Soils and Its Implication on Fertiliser Placement

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The correct placement of fertilisers is critical, as losses can be very significant especially in regions of high and frequent rainfall, non-terraced slopes, sandy textured soils and peat. To maximise uptake efficiency, fertilisers should be evenly broadcast over the soil surface area that contains the highest density of feeder roots. In order to determine the latter, an investigation was undertaken to ascertain the biomass and distribution of roots of various ages of mature oil palms planted in both mineral and second generation peat soils.

Results of the study indicate that if site factors are not limiting, palm age and past fertiliser placement history are two major factors influencing oil palm root development and distribution.

In mature well decomposed peat, although roots could be found growing 4 m from palm bole, actual root biomass per unit volume of soil was low. Only 21 per cent of the feeder roots of 8-year-old palms were found growing outside the weeded palm circles (WPC). Even within the latter, approximately 50 per cent were concentrated within a radius of 1 m from the palm bole. The low bulk density and high porosity of peat appears to discourage roots from growing beyond this distance.

In mineral soils, there was a consistent and gradual increase in root spread beyond the WPC, with palm age. Feeder root distribution beyond a 2 m radius ranged from as low as 26 per cent in 6-year-old palms planted on terraces to 41 per cent for 8-year-old palms established in non-terraced soils. Only palms older than 10 years of age had root biomass greater than 50 per cent beyond this radius.

In all sites, there was an increase in primary and secondary root biomass with soil depth and a linear decrease in feeder root biomass down the soil profile. Soil chemical analysis indicated that apart from palm age, the horizontal and vertical distribution of feeder roots was strongly influenced by soil fertility gradients created by past fertiliser placement history. As fertilisers were previously applied entirely in the WPC for younger palms (<8 years), there was a significant decline in soil fertility with increasing distance from the palm bole and increasing soil depth. The majority of feeder roots were concentrated within the 2 m radius from the palm bole and in the top 20 cm of soil, where nutrient levels were the highest. In older palms (>10 years) where fertilisers had been broadcast over frond heaps in the interpalm spaces and interrows, feeder root biomass was higher outside the WPC, as soil fertility gradients were less apparent.

Taking into account the root distribution patterns of oil palm in relation to palm age, specific recommendations on fertiliser placement for oil palm grown on mineral and peat soils are made, so as to improve fertiliser uptake and utilisation.

Keywords: *Fertiliser placement, oil palm, mineral soils, peat soil, root distribution.*