

Fertilizer Management and Nutrient Use Efficiency of Oil Palm

Oil palm (*Elaeis guineensis*) is one of the most important agricultural crops in the tropics. Palm oil and palm kernel oil extracted from fresh fruit bunches account for 36% of the global vegetable oil production (FAO, 2015). The area of oil palm plantations is more than 16 million ha, with more than half located in Malaysia and Indonesia (FAO, 2015; Sayer *et al.*, 2012). Enhancing dry matter production with higher partitioning to fruit bunches is important for sustainable intensification of oil palm.

A series of best management practice guidelines has been developed to intensify crop production through a range of agronomic practices, including nutrient management, suitable drainage, optimal canopy management and harvesting schemes (Donough *et al.*, 2009; Fairhurst and Griffiths, 2014). The design and implementation of these practices are adapted to environmental conditions and soil fertility of each commercial estate (Oberthür *et al.*, 2013).

We established a four-year field trial in commercial oil palm plantations at six study sites in Indonesia with a wide range of climates and soils. We compared dry matter production and partitioning under paired treatment blocks of best management practices and standard estate practices. We estimated the aboveground dry matter production (fruit bunch, frond, and trunk) using existing allometric relationships (Corley and Tinker, 2015; Fairhurst and Hårdter, 2003).

Our study showed that the annual production of aboveground dry matter was $30.0 \pm 0.5 \text{ t ha}^{-1} \text{ yr}^{-1}$ (mean \pm SE) under best management practices, higher than $28.8 \pm 0.5 \text{ t ha}^{-1} \text{ yr}^{-1}$ under standard estate practices. The bunch index, an indicator of the fruit production efficiency, increased by 12% under best management practices compared to standard estate practices. Partitioning of dry matter to the fronds decreased by 8% under best management practices, compared to standard estate practices. The positive effect of best management practices on the annual production of total aboveground dry matter was stronger in the plantation site with higher annual rainfall. These results are useful for optimizing management practices to improve sustainable intensification of oil palm.

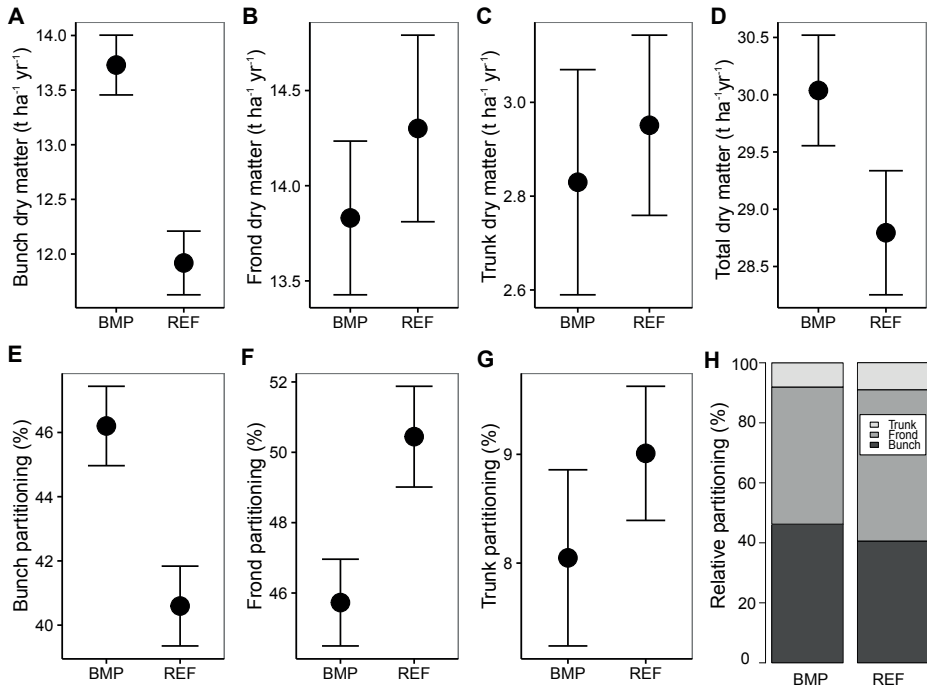


Figure 1. The annual production and partitioning of dry matter (mean ± SE) under best management practices (BMP) and standard estate practices (REF). The values were averaged across study site and sampling year. The annual production of fruit bunch, frond, trunk, and the total aboveground dry matter is shown in A, B, C, D, respectively. The partitioning of dry matter to fruit bunches, fronds, and trunk is shown in E, F, and G, respectively. The relative partitioning of fruit bunches, fronds, and trunk under the two practices is shown in H.

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