‘Hidden hunger’: poorly balanced plant nutrition in Indonesian oil palm farming

Introduction and problem statement

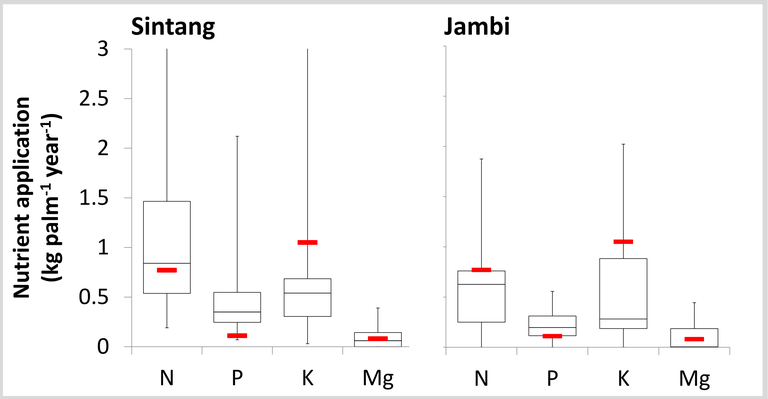
- 13 million hectares of oil palm plantations in Indonesia
- Continued expansion threatens valuable rainforests
- 6 million hectares owned by smallholders
- Potential yield >35 ton fruit bunches per hectare
- Smallholder yield typically only 16 ton per hectare
- Could poor nutrition be a cause of this yield gap?

Conclusions & recommendations

We show for the first time that poorly balanced plant nutrition has led to severe nutrient deficiencies in smallholder oil palm plantations in Indonesia.

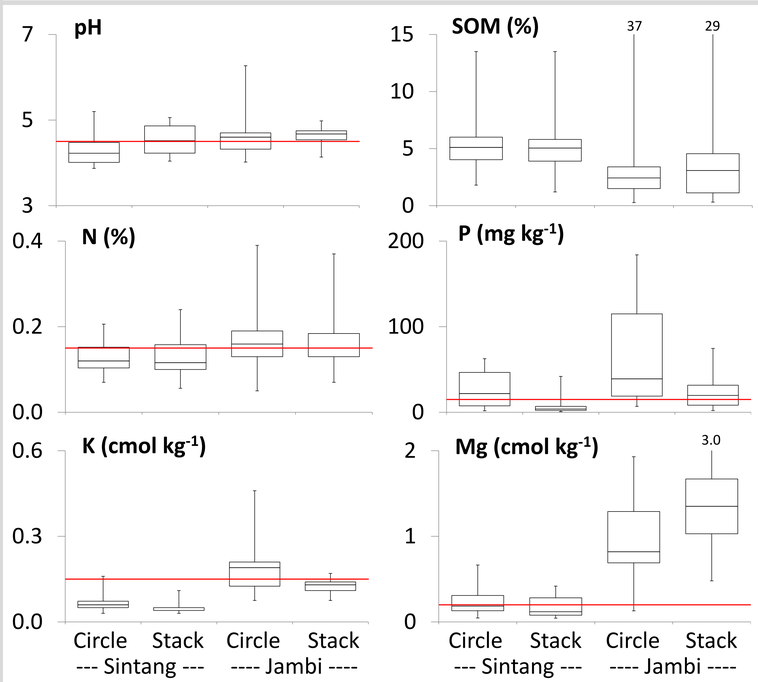
- We found widespread lack of K application (Fig. 1) and poor K status in the leaf tissue (Fig. 3)
- Nutrient deficiencies are probably a key yield limiting factor
- Poorly balanced plant nutrition => poor sustainability in terms of yield, profit, environment
- Improved fertiliser application practices should be a key target of interventions

Figure 1: Nutrient application



Reported nutrient applications in Sintang and Jambi for N, P, K and Mg, showing minimum, 1st quartile, median, 3rd quartile, and maximum. The red lines show the minimum recommended applications.

Figure 2: Soil fertility



Soil pH, organic matter, and nutrient concentrations in Sintang and Jambi in the circle and under the frond stack (Fig. 4). Red lines show critical values.

Results

- Vegetative growth and yield mostly suboptimal (data not shown)
- Most palms K deficient; some other nutrients applied in excess (Fig. 1, 3)
- Palms in Jambi K deficient despite high soil K (Fig. 2), indicating poor potassium availability
- Fertilisers mostly applied in the palm circle, leading to nutrient concentration and soil acidification (Fig. 2)

Figure 4: Important terms

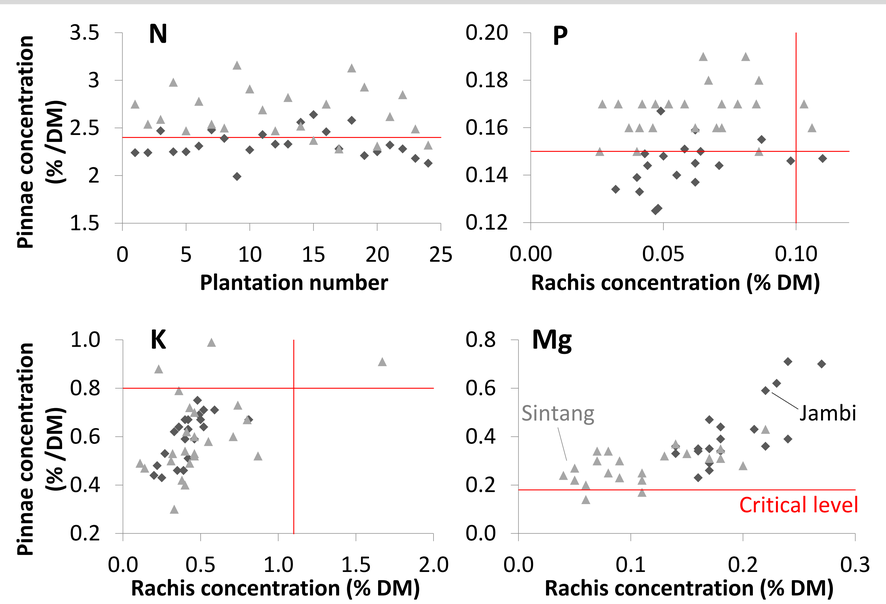
Fruit bunches | Pinnae and rachis

Palm circle | Frond stack

Methods

- Two sites: Sintang (Kalimantan) and Jambi (Sumatra) with contrasting soils and socio-economic conditions
- Random sample of 24 farmers in Sintang and 25 in Jambi
- Interviews about management practices
- Collection of soil and leaf samples from four palms per plantation
- Samples were analysed in the lab using standard analytical procedures

Figure 3: Tissue nutrient concentrations



Nutrient concentrations in the pinnae (y-axis) and rachis (x-axis) of the sample palms in Sintang and Jambi (Fig. 4). The red lines shows the ‘deficiency threshold’ in pinnae (horizontal) and rachis (vertical). Rachis values for N were not determined.

Lotte Suzanne Woittiez, Maja Slingerland, Ken E. Giller

Wageningen University, Plant Production Systems Group
Contact: lotte.woittiez@wur.nl

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