

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

Introduction and problem statement

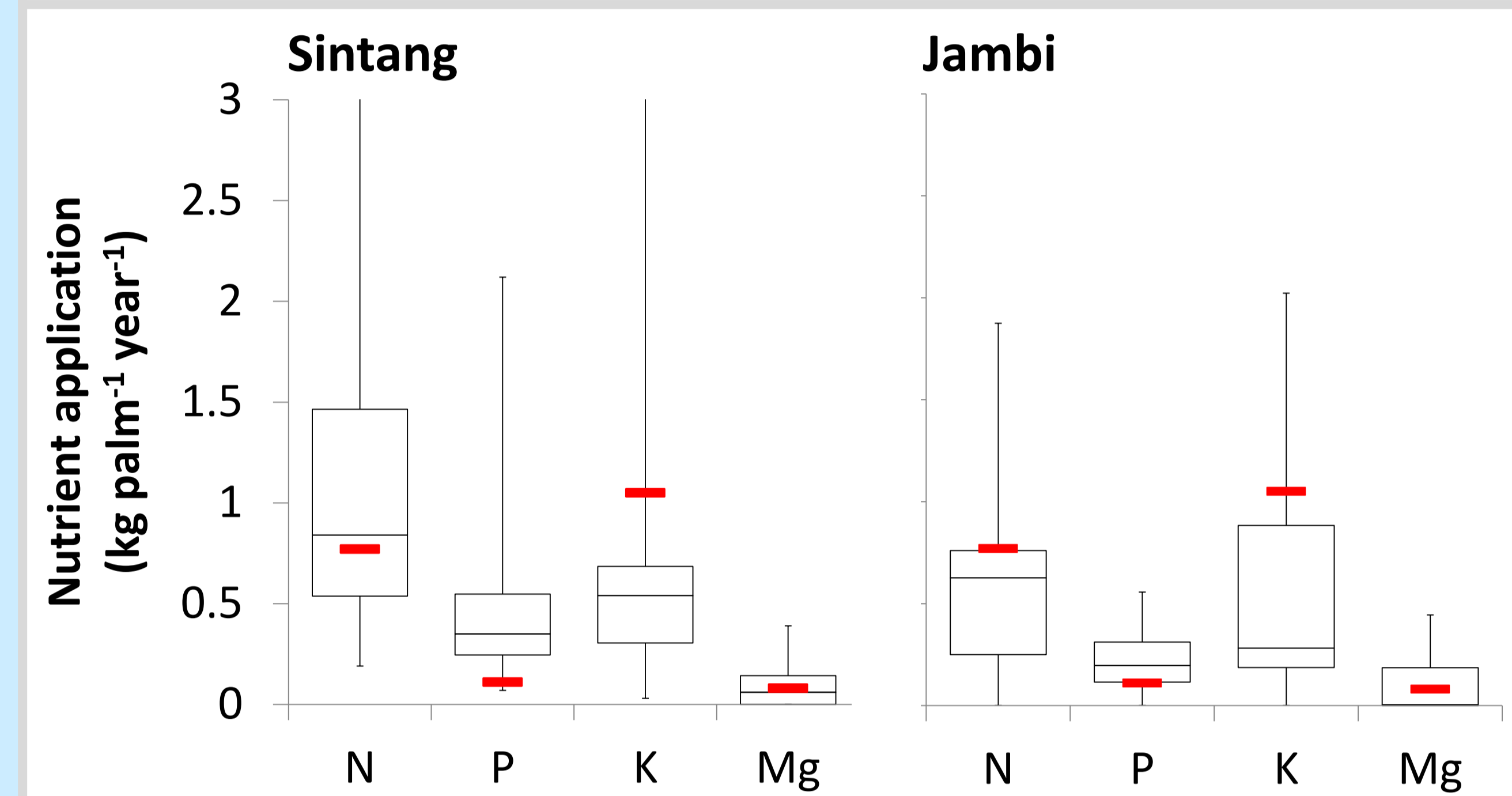
- 13 million hectares of oil palm plantations in Indonesia
- Continued expansion threatens valuable rainforests
- 6 million hectares owned by smallholders
- Potential yield >35 ton fruit bunches per hectare
- Smallholder yield typically only 16 ton per hectare
- Could poor nutrition be a cause of this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

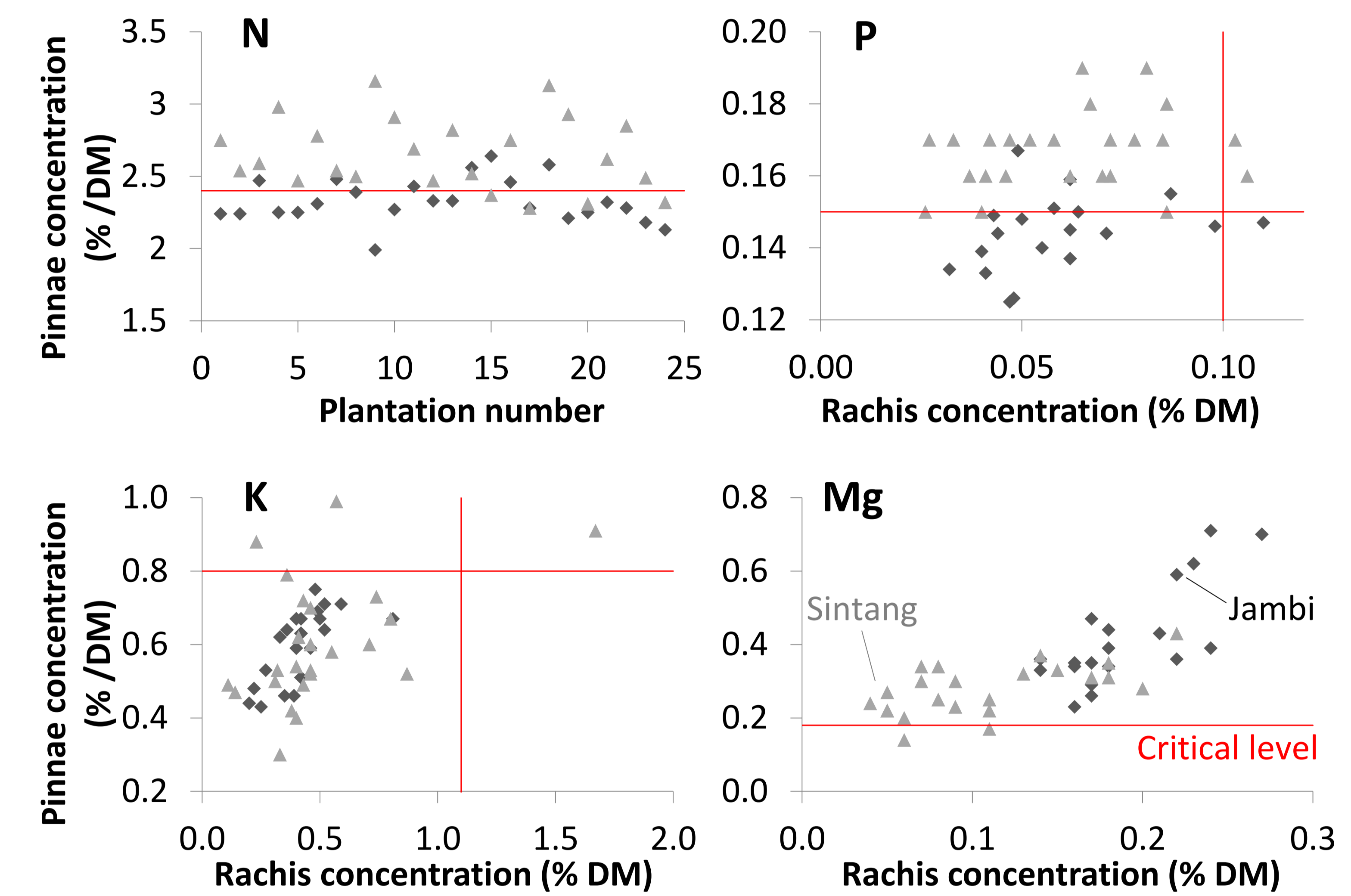


Reported nutrient applications in Sintang and Jambi for N, P, K and Mg, showing minimum, 1st quartile, median, 3rd quartile, and maximum. The red lines show the minimum recommended applications.

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 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 show the 'deficiency threshold' in pinnae (horizontal) and rachis (vertical). Rachis values for N were not determined.

Figure 4: Important terms



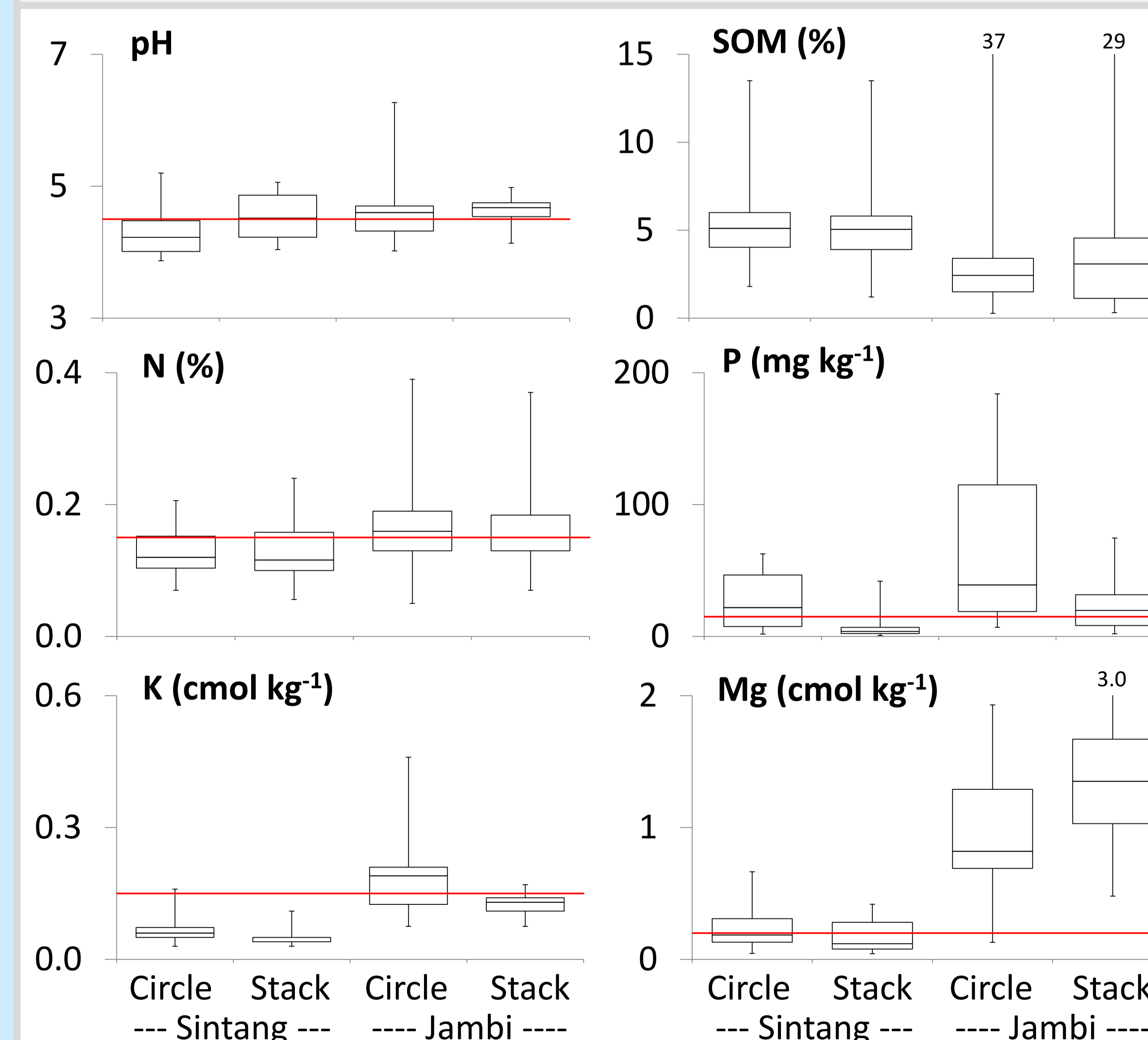
Fruit bunches

Pinnae and rachis

Palm circle

Frond stack

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.

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

Lotte Suzanne Woittiez, Maja Slingerland, Ken E. Giller

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

Brian Chambers Award, IFS conference
Cambridge, December 2016



We thank K+S Kali, SNV Indonesia, and Wageningen University for funding this research. We also thank Turhyna, Desnawaty, Ariyanto, Haryonani, and all participating farmers for the enthusiastic collaboration.

Our commercial partners played no role in the collection, analysis and interpretation of data, in the writing, nor in the decision to publish.