

YIELD GAPS IN INDONESIAN SMALLHOLDER PLANTATIONS

KEY CAUSES OF SUBOPTIMAL PALM OIL YIELDS



Why do smallholder oil palm farmers in Indonesia produce sub-optimal yields?

We interviewed 70 independent farmers in Sumatra and Kalimantan about their oil palm management. In addition we made field observations and we carried out soil and leaf analysis in 30 selected plantations.

Key findings:

- **The majority of farmers did not implement optimum management strategies in terms of weeding, pruning, harvesting, and fertilisation**
- **Farmers often selected fertilisers based on price, rather than nutrient content or quality; they relied mostly on subsidised NPK (15-15-15), urea, and SP-36**
- **Potassium deficiency was measured in >80% of the plantations**
- **Other key issues were low-quality planting material (>50% of plantations contaminated with Dura), water logging (in up to 50% of the plantations) and poor harvesting practices**



1. BACKGROUND

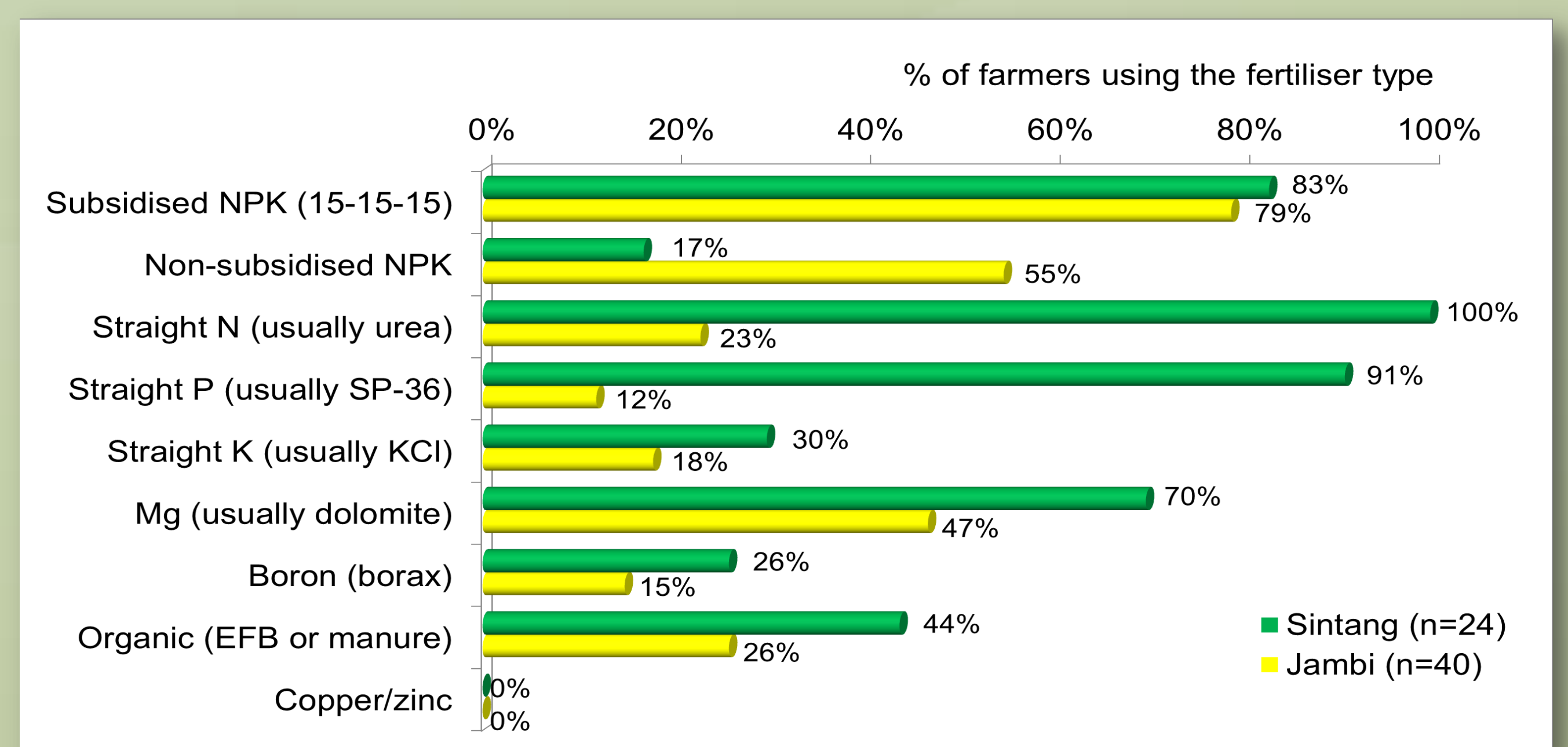
- 44% of the oil palm area in Indonesia is owned by smallholders
- On average smallholders produce only 15-20 t FFB per hectare
- We need to understand what factors limit smallholder yield
- Therefore we have interviewed 70 farmers in Sintang and Jambi using semi-structured questionnaires
- We have also assessed 30 independent plantations for deficiency symptoms and Dura contamination, and we collected soil and leaf samples



Map of Indonesia with the two research locations

2. FERTILISER USE

- The majority of the farmers used nitrogen (N), phosphorus (P) and magnesium (Mg) fertilisers
- Potassium (K) was mostly applied only as NPK 15-15-15
- Most farmers did not apply straight K or boron (B), because these fertilisers were considered “too expensive”
- Empty fruit bunches (EFB) were not always available for the smallholders and were used only by a minority
- The applications of K and B were much less than recommended and severe deficiencies were expected



Use of different types of fertilisers (% of respondents)

3. NUTRIENT DEFICIENCIES

- Oil palm needs sufficient nitrogen, phosphorus, potassium, magnesium and boron to produce good yields
- In our research, potassium deficiencies were found in >80% of the plantations, both in the tissue and in the soil
- Nitrogen, phosphorus and magnesium deficiencies were diagnosed in 40-60% of the plantations
- Visual deficiencies of boron were commonly observed but not measured
- Yields are very likely to improve if the deficiencies are corrected
- We are currently testing the effects of better fertilisation in the field

		Sintang (n=24)		Jambi (n=6)	
		Average	StDev	Average	StDev
Leaflets					
Nitrogen	% DM	2.66	0.25	2.29	0.11
Phosphorus	% DM	0.17	0.01	0.15	0.01
Potassium	% DM	0.60	0.17	0.63	0.14
Magnesium	% DM	0.28	0.07	0.30	0.06
Boron	mg/kg DM	10.4	1.94	nd	nd
Rachis					
Phosphorus	% DM	0.06	0.02	0.07	0.02
Potassium	% DM	0.50	0.31	0.40	0.19
Magnesium	% DM	0.11	0.05	0.15	0.04
Boron	mg/kg DM	8.34	1.09	nd	nd

Average tissue nutrient concentrations (deficiencies are indicated in red)



Rock phosphate application to increase soil phosphorus and relieve soil acidity

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Lotte S. Woittiez, Maja Slingerland, Ken E. Giller
Wageningen University
Plant Production Systems Group
Contact: lotte.woittiez@wur.nl

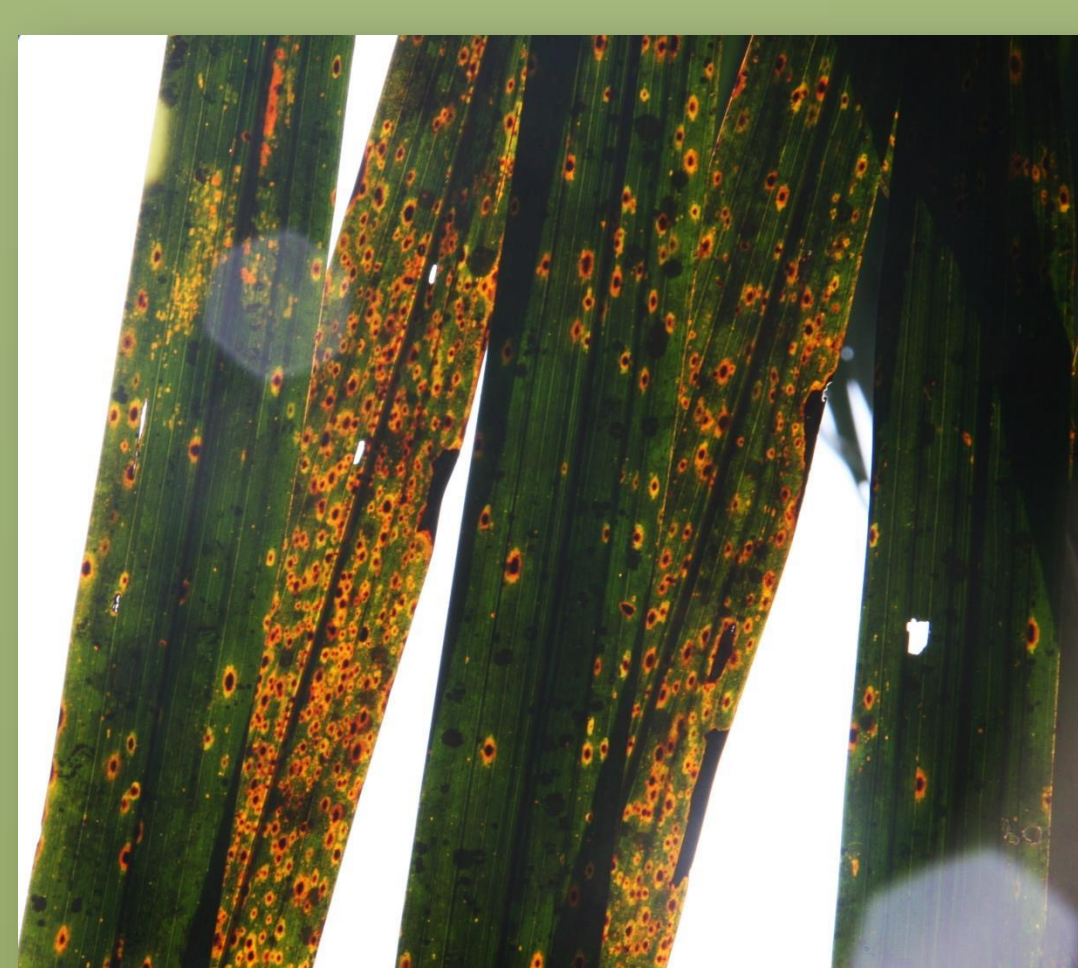
PIPOC, Kuala Lumpur, October 2015



Nitrogen deficiency



Phosphorus deficiency



Potassium deficiency



Magnesium deficiency



Boron deficiency