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"Resilience of agricultural systems against crises"

Simulating Potential Yield in Oil Palm: Its Application in Yield Gap Analysis and the Limitations

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Abstract

Knowledge about yield gaps, *i.e.* the difference between attainable and actual yield, is key information for sustainably intensifying crop production systems. For oil palm, one of the fastest growing agricultural industries in SE Asia, increasing yields on existing plantations is needed to meet the increasing demand for vegetable oil and to avoid further pressure for new plantations. Considering that average yields of 4 t oil ha^{-1} are commonly reported in Indonesia and that yields of 8 t ha^{-1} at the block scale and 6 t ha^{-1} at the plantation scale are achievable, large yield increases should be possible. One of the most promising methods for increasing yield is through the use of "Best management practices" (BMP) to increase the yield in mature plantations. These practices, promoted by the International Plant Nutrition Institute (IPNI), include practices such as improved harvest techniques and optimised nutrient management. From 2006–2010, these BMP's were tested on block scale at six sites located in Kalimantan and Sumatra. Results show that yields in blocks managed according to the BMP guidelines were significantly higher than in standard managed blocks across these different sites. However, as the potential yield is unknown at the specific site, it is hard to judge how much BMP contributes to closing the hypothesised yield gap. A recently developed oil palm growth model PALMSIM has been employed to simulate potential yield based on incoming radiation and water availability for the blocks in the six sites.

The paper will present the simulated results compared with yield achieved under standard management and BMP. The difference between actual and simulated yield answers how much BMP contributes to close the gap in relation to potential yield. It is argued that simulating the yield by a potential crop growth model is a necessary first step, but as long as site-specific yield determining factors such as rooting depth and local hydrology are ignored, the potential yield can be often overestimated. For some sites soil restrictions may cause a larger gap between potential and site-specific potential yield. Future modelling work in oil palm has to address effects of inherent soil characteristics on site specific potential yield.

Keywords: Crop growth modelling, Indonesia, oil palm, potential yield, yield gap analysis

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