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"Filling gaps and removing traps
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The Effect of Soil Conservation Practices on Soil Carbon and Yields in Smallholder Oil Palm Plantations

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Abstract

The progressive expansion of oil palm plantations in South East Asia leads to a conversion of tropical rainforests. This transformation reduces soil organic carbon (SOC) contents significantly. Since a reduction in SOC levels is also linked to a decrease in many important soil ecosystem services, such as water and nutrient regulation which positively affect yields, it might negatively affect the income of oil palm farmers.

One option to sustain and enhance SOC contents is the use of soil conservation practices such as mulching or cover crop application. These practices might affect yields via various channels: First, via an increase in soil carbon content, but also via a direct fertilisation or nutrient competition effects.

Despite its theoretical relevance for farmers' income, the agronomic effects of SOC on oil palm yields, especially in smallholder plantations, have rarely been analysed. Therefore, we study the effect of soil conservation practices on soil indicators and yields, and the effect of SOC on yields to distinguish between the pathways through which soil conservation practices can affect oil palm yields.

Our study was conducted in Jambi Province, Indonesia, in 2017. We focus on the application of empty fruit bunch (EFB) mulching and cover crops (CC) as soil conservation practices in smallholder plantations. Smallholder plantations are chosen because of their growing importance in the Indonesian oil palm sector.

Using a stratified random sampling procedure, we selected 142 independent oil palm growing smallholders. Per household, one plantation was selected. Soil samples were collected for SOC content and bulk density measurements.

Our results hint to a positive effect EFB application on soil carbon, but the effect of CC is insignificant. While the direct effect of SOC on per hectare oil palm yields is insignificant, application of EFB is associated with statistically higher oil palm yields in comparison to CC application and the control group. This suggests that the fertilising effect of EFB mulching might be more important than the effect via improved soil fertility.

Keywords: Oil palm yields, smallholder farmers, SOC, soil conservation practices

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