

Transpiration on the rebound in lowland Sumatra

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Abstract	<p>Following large-scale conversion of rainforest, rubber and oil palm plantations dominate lowland Sumatra (Indonesia) and other parts of South East Asia today, with potentially far-reaching ecohydrological consequences. We assessed how such land-use change affects plant transpiration by sap flux measurements at 42 sites in selectively logged rainforests, agroforests and rubber and oil palm monoculture plantations in the lowlands of Sumatra. Site-to-site variability in stand-scale transpiration and tree-level water use were explained by stand structure, productivity, soil properties and plantation age. Along a land-use change trajectory forest rubber-oil palm, time-averaged transpiration decreases by 43 +/- 11% from forest to rubber monoculture plantations, but rebounds with conversion to smallholder oil palm plantations. We uncovered that particularly commercial, intensive oil palm cultivation leads to high transpiration (827 +/- 77 mm yr(-1)), substantially surpassing rates at our forest sites (589 +/- 52 mm yr(-1)). Compared to smallholder oil palm, land-use intensification leads to 1.7-times higher transpiration in commercial plantations. Combined with severe soil degradation, the high transpiration may cause periodical water scarcity for humans in oil palm-dominated landscapes. As oil palm is projected to further expand, severe shifts in water cycling after land-cover change and water scarcity due to land-use intensification may become more widespread.</p>
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