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Expansion of oil palm cultivation in the Amazon: potential impacts on carbon fixation and water use

Carvalho CJ¹, Araujo AC¹, Santiago AV¹, Martorano LG¹, Venturieri A¹, Vasconcelos SS¹ - ¹Embrapa Amazonia Oriental

The demand for plant oils for food and biofuels has increased significantly and the participation of oil palm in the world market is increasing. The Brazilian Program for Sustainable Oil Palm (launched in June 2010) aims at expanding the cultivation of oil palm by up to 350,000 hectares over the next 10-12 years focusing on degraded pastures and other altered areas. Due to oil prices and future projections of increasing oil demand, large projects have settled in the state of Pará, increasing the cultivated area from 70,000 to 120,000 hectares in the last 2 years. Converting former slash-and-burn areas that are used for agriculture and pasture to oil palm plantations has impacts on carbon sequestration and on greenhouse-gas emissions since the former systems usually functioned as carbon sources due to land degradation and fire. The cultivation of oil palm occupies the land for up to 22 consecutive years with great potential to result in a positive carbon balance because photosynthetic rates of *Elaeis guineensis* can reach up to $25 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$, considered high when compared with other tropical pioneer species such as *Racosperma mangium* and *Sclerolobium paniculatum* ($\sim 15 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$). Thirteen-year-old oil palms can accumulate 70 Mg ha^{-1} aboveground. To achieve this productivity the palms need ample water supply to satisfy their demands, which result from their crop architecture and large leaf area (up to 380 m^2). The expansion of oil palm is taking place in areas likely to be affected by climate change, which will require the development of drought-tolerant hybrids. Here we discuss the implications of such a scenario for oil palm expansion in Amazonia, based on drought-tolerant materials, rain-fed cultivation systems, and use of water resources in other regions (e.g., Cerrado) and its consequent environmental costs.