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Analysis of Trade as a Driver of Oil Palm Expansion: The Implications for Peatlands in Indonesia and Malaysia

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Introduction

There is international concern regarding the carbon emissions of oil palm cultivation, particularly where areas of tropical peatlands are cleared, drained and planted. This problem has been growing as areas of suitable agricultural land are being lost to degradation, urbanization or land use conflicts, displacing cultivation to marginal lands such as peatlands. Southeast Asia is home to approximately 24.8 million hectares (mha) of peatland, with an estimated 2.1 mha in Indonesia and Malaysia currently planted with industrial oil palm plantations.

Methods

This study focuses on Indonesia and Malaysia, looking at recent peatland cultivation. Projections of likely oil palm cultivation including the proportion expected to occur on peatlands will be performed using a computable general equilibrium model, MIRAGE. The time frame for this modeling will be for 50 years, where replanting, peat subsidence and climate change are important factors to consider.

The Model (MIRAGE)

Is a multi-sector, multi-region Computable General Equilibrium Model (CGE) for trade policy analysis. Based on input data from the Global Trade Analysis Project (GTAP) version 7, where the base year is 2004. The model was modified by breaking apart the vegetable oil sectors and including biodiesel and ethanol markets. It has been used in a number of studies to assess the land use change (LUC) implications of biofuel policies (Al-Riffai et al., 2010; Laborde, 2011).

What is the problem with planting on peatland?

For one, the level of CO_2 released due to oxidation of the drained peat is extremely concerning. There remains uncertainty regarding the actual annual tons of carbon released due to oxidation and subsidence; however, it has been estimated in the tropics to be 40-70 tons C ha^{-1} $year^{-1}$. For 2006, approximately 355-855 Mt C yr^{-1} was released from drained peatlands in Southeast Asia (Hooijer et al., 2010). The scale of peat emissions can easily trump all other sources of emissions as evidenced by carbon life-cycle analysis of biofuel produced from palm oil (see Figure 1). In addition, peatlands have a finite lifetime once cultivated, as each year approximately 4.5 cm is lost to subsidence and oxidation (Hooijer et al., 2010; Stephens et al., 1984) (see Figure 2). Therefore, if the peat is 3 meters deep (the legal maximum allowed to be planted), the planted area will disappear after 67. If too many areas are planted on peat, this could have serious implications for food security in the future.

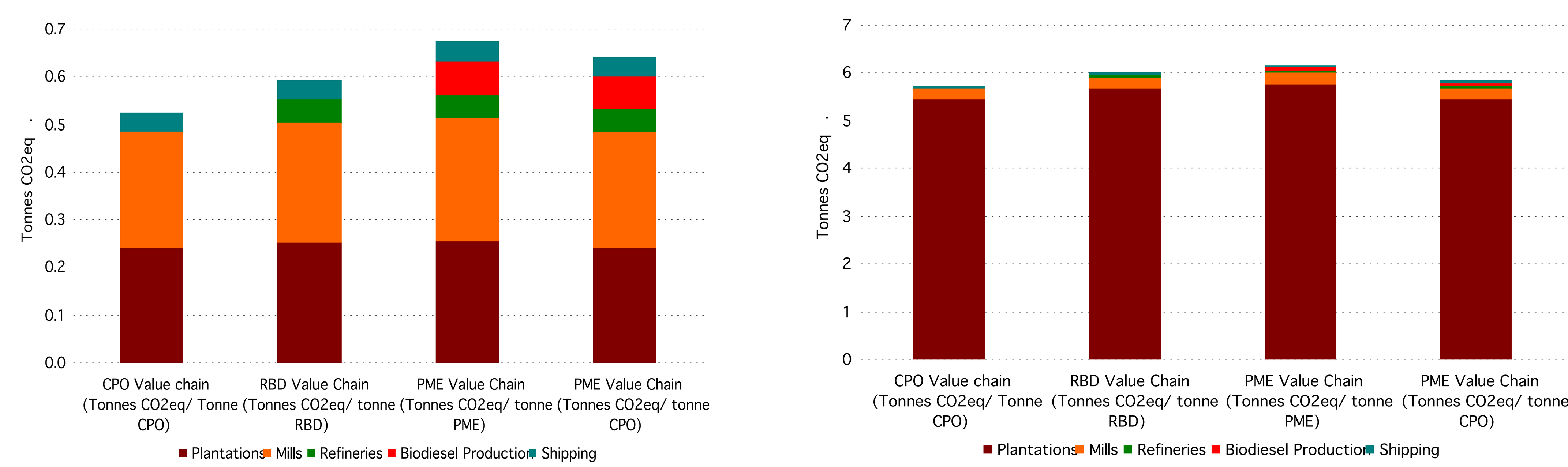

Figure 1: *Carbon footprint estimates for crude palm oil (CPO) and refined bleached deoderized palm oil (RBD), with and without the inclusion of peatland emissions.*

Finally, it is among the most expensive land covers to plant on (e.g. high up front costs and higher fertilizer inputs) as well as achieving the lowest average yields, roughly 13% less (Fairhurst and McLaughlin, 2009) (see Figure 3).

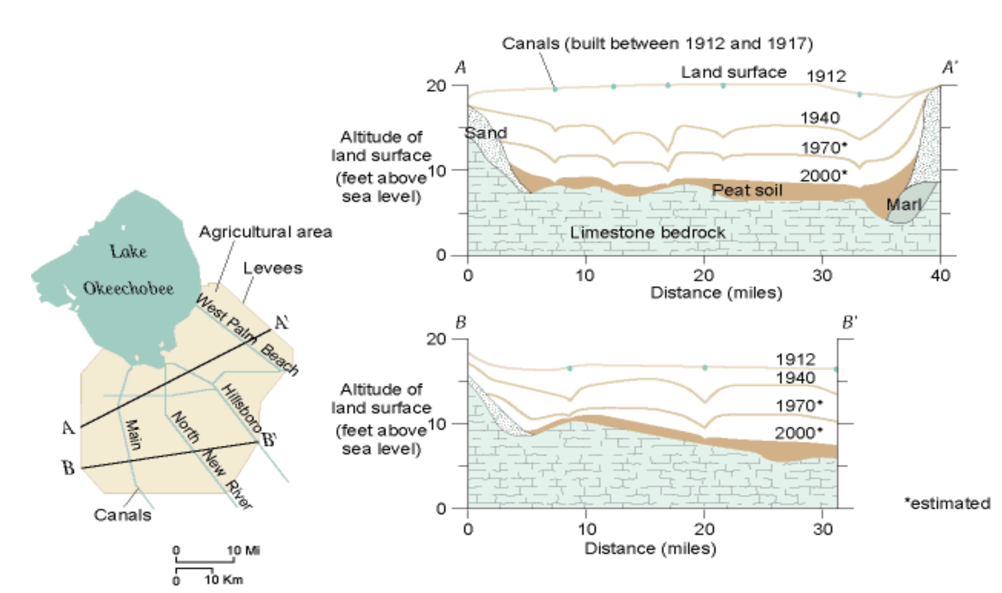

Figure 2*: Graphic of peat subsidence and eventual loss from a long-term study of the everglades by Stephens et al (1984).*

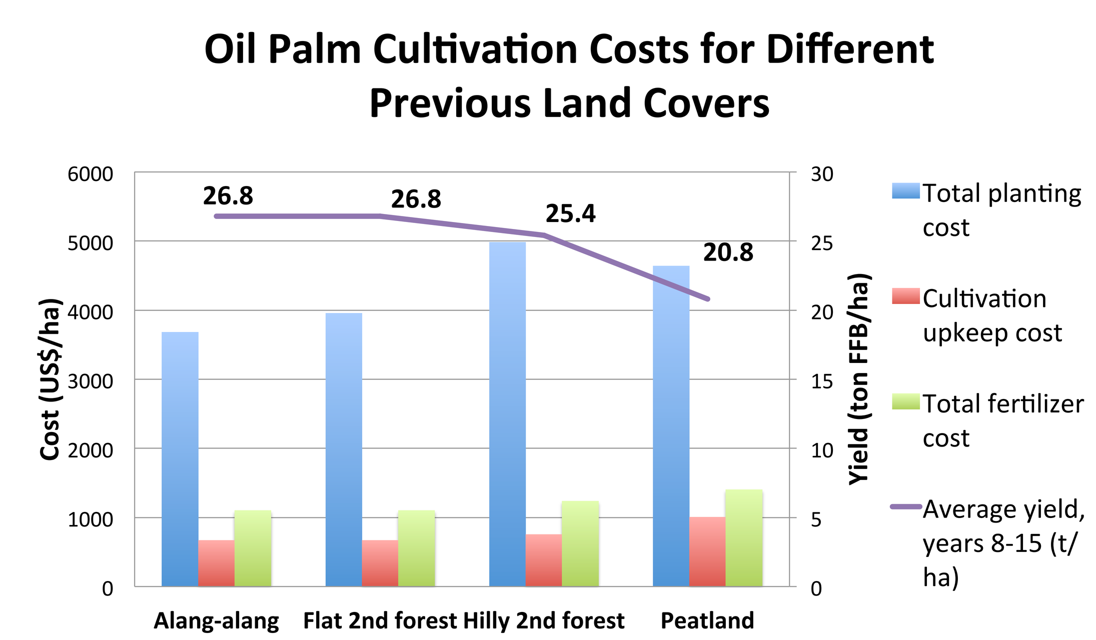

Figure 3*: Yield and cost estimates for oil palm on different land covers. From Fairhurst and McLaughlin (2009).*

Past rates of planting on Peatland

Thirty years ago it was extremely rare for companies to plant on peatlands; however, recently the proportion of oil palm plantations on peatland has been increasing steadily, particularly in the areas of greatest oil palm expansion (e.g. Kalimantan and Sarawak) (see Figure 4).

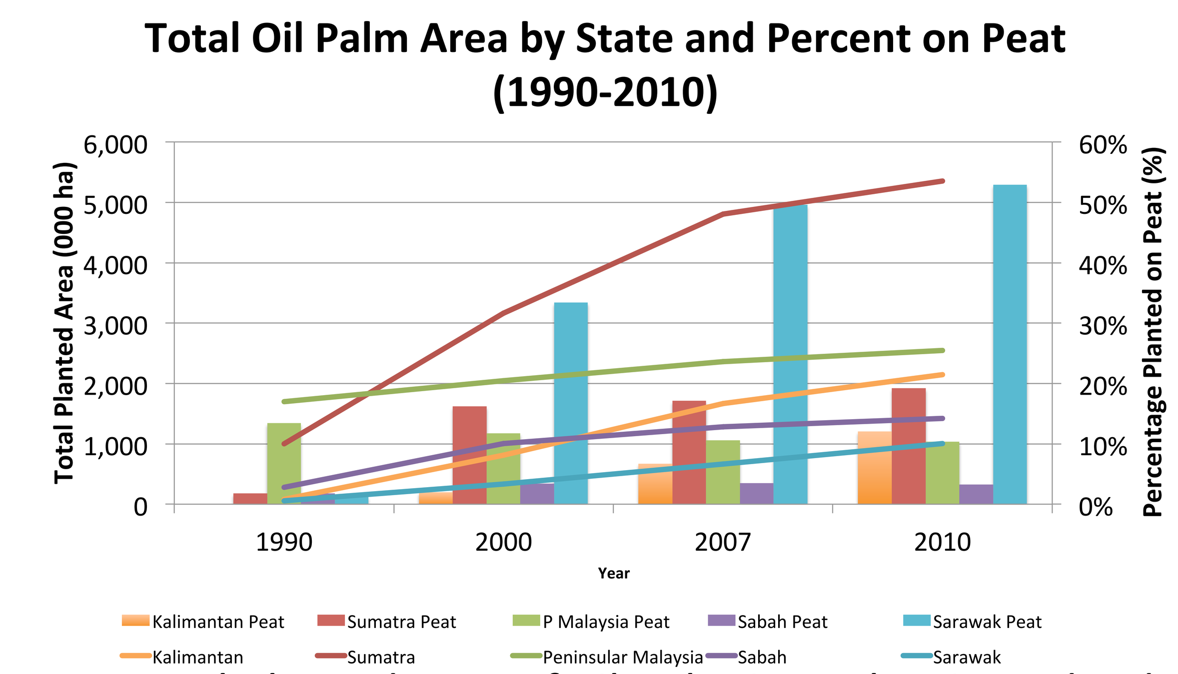

Figure 4: *Total planted area of oil palm in Malaysia and Indonesia, by state, as well as percentage of areas on peatland. From the Indonesian Department of Agriculture and Mietinnen, unpublished data.*

There have been several recent efforts to project likely expansion of oil palm plantation on the peatlands of this region, which would have huge implications for climate change mitigation efforts (Koh et al., 2011; Wicke et al., 2011); however, none of these has taken into account the role of international trade as a driver of this expansion. Hence our use of the MIRAGE model with a number of future demand/trade scenarios and the inclusion of possible oil palm expansion into Africa and South America.

Next steps

Unfortunately, running this model has been delayed due to the complexity of understanding land use decisions in Indonesia, particularly as these decisions are made non-transparently at the sub-province level (Burgess et al., 2010). Without understanding the approximate economic costs of these decisions, trade modeling has been difficult; however we hope to have initial results in the next few months.

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