LIFE CYCLE ASSESSMENT OF COMPOSTING OF PALM OIL RESIDUES

Heinz Stichnothe and Frank Schuchardt
Institute of Agricultural Technology und Biosystems Engineering Bundesallee 50, 38116 Braunschweig
Email: heinz.stichnothe@vti.bund.de

Johann Heinrich von Thünen-Institut

Problem

Residues of palm oil mills

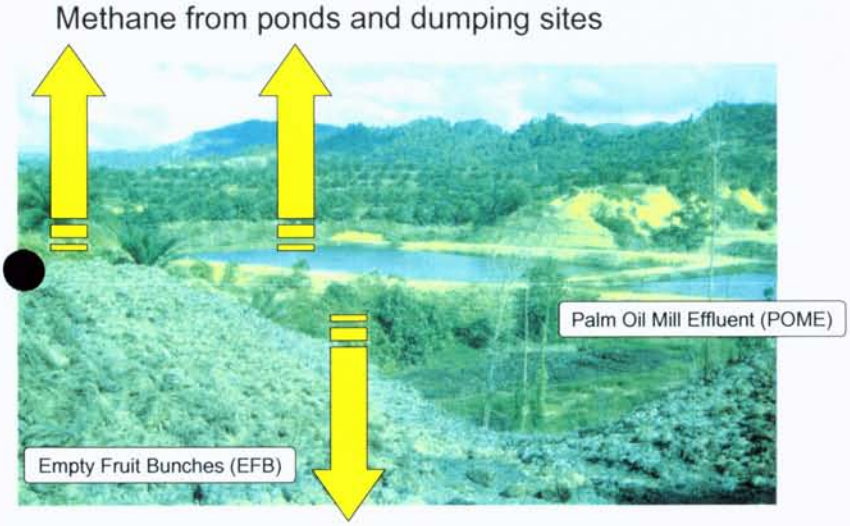

Fig 1: Water pollution due to EFB and POME

More than 40 million tonnes of palm oil has been produced last year. For producing 1 t crude palm oil (CPO) 5 t fresh fruit brunches (FFB) are required while 1.15 t empty fruit bunches (EFB) and 3.75 t palm oil mill effluent (POME) are generated. Those residues are either a source of pollutants or can be recycled to recover nutrients in a cost saving manner. The potential of nutrient recovery and its effect on greenhouse gas emissions associated with CPO-production are investigated via life cycle assessment using 1 t FFB as functional unit.

Life Cycle Assessment of composting

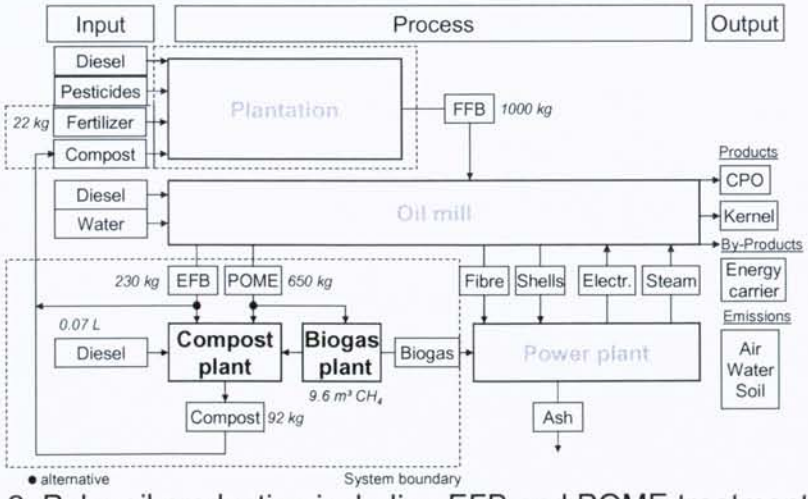

Fig 2: Palm oil production including EFB and POME treatment

A life cycle approach according to ISO 14040 and 14044 has been used to calculate the nutrient recovery potential and the GHG saving potential from palm oil mill residue treatment outlined in Fig. 2. Data from Rettenmeier et al. 2007 has been used as reference system for the palm oil production while data for the composting process and GHG emissions from open ponds are taken from Schuchardt et al. 2008.

Results

The main advantage of the composting process is the simultaneous treatment of POME and EFB, which enables the recovery of nutrients from both. Due to co-composting 41% Mg, 68 % K, 14% P and 22% N can be recycled. Recovery of Mg increases to 98%, of K to 68% and of P to 73% when the ash of the power plant is used on the plantation too. If returning EFB to the plantation and storing POME in open ponds is considered as state-of-the-art co-composting reduces direct GHG emissions from palm oil production residues from 122 kg CO_{2eq} / t FFB to 7 kg CO_{2eq} / t FFB. The total GHG reduction is even greater as utilising compost reduces the inorganic fertiliser demand on palm oil plantations.

References

Rettenmaier N, Reinhardt G, Münch J, Gärtner S (2007) Netzwerk Lebenszyklusanalysen Datenprojekt "Nachwachsende Rohstoffe". ifeu - Institut für Energie- und Umweltforschung Heidelberg GmbH

Schuchardt F, Wulfert K, Darnoko D, Herawan T (2008) Effect of new palm oil mill processes on the EFB and POME utilisation. Journal of Oil Palm Research (Special Issue October 2008):115-126