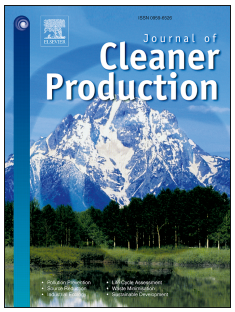
Accepted Manuscript



Environmental sustainability of oil palm cultivation in different regions of Thailand: Greenhouse gases and water use impact

Thapat Silalertruksa, Shabbir H. Gheewala, Patcharaporn Pongpat, Piyanon Kaenchan, Napapat Permpool, Naruetep Lecksiwilai, Rattanawan Mungkung

PII: S0959-6526(16)31908-4

DOI: 10.1016/j.jclepro.2016.11.069

Reference: JCLP 8458

To appear in: *Journal of Cleaner Production*

Received Date: 15 January 2016

Revised Date: 5 November 2016

Accepted Date: 11 November 2016

Please cite this article as: Silalertruksa T, Gheewala SH, Pongpat P, Kaenchan P, Permpool N, Lecksiwilai N, Mungkung R, Environmental sustainability of oil palm cultivation in different regions of Thailand: Greenhouse gases and water use impact, *Journal of Cleaner Production* (2016), doi: 10.1016/j.jclepro.2016.11.069.

Environmental Sustainability of Oil Palm Cultivation in Different Regions of Thailand: Greenhouse Gases and Water Use Impact

Thapat Silalertruksa[1,2], Shabbir H. Gheewala[1,2*], Patcharaporn Pongpat[1,2], Piyanon Kaenchan[1,2] Napapat Permpool[1,2], Naruetep Lecksiwilai[1,2] and Rattanawan Mungkung[3]

[1]The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, 126 Prachauthit, Bangmod, Tungkru, Bangkok 10210, Thailand

[2]Center of Excellence on Energy Technology and Environment, PERDO, Bangkok, Thailand

[3]Centre of Excellence on enVironmental strategyfor GREEN business (VGREEN), Faculty of Environment, Kasetsart University, 50 Ngamwongwan, Chatuchak, Bangkok 10900, Thailand

E-mail contact: shabbir_g@jgsee.kmutt.ac.th

Abstract

The increased demand in Thailand for palm oil for food, cosmetics and especially biodiesel has resulted in the rapid expansion of oil palm cultivation nationwide. This has raised concerns on the environmental sustainability of oil palm cultivation especially in the regions where land and climate are less suitable for oil palm. The study assesses the life-cycle greenhouse gas (GHG) emissions, water use and water scarcity footprint of oil palm cultivation in the different regions of Thailand. There is a wide variation of GHG emissions and irrigation water required ranging between 64–225 kg CO_2eq /t FFB and 550-1,749 m^3/t FFB, respectively. Oil palm cultivation in the South brings about the lowest water scarcity footprint i.e. around 2-13 m^3H_2Oeq/t FFB followed by the East, North, Central and Northeast, respectively. Promotion of oil palm cultivation must thus be based on land and climate suitability considerations along with good practices for productivity improvement. Recommendations have been discussed for enhancing sustainable oil palm cultivation which in turn will improve the competitiveness of the Thai palm oil industry.

Keywords: Oil Palm; Greenhouse Gases; Water scarcity footprint; Life cycle assessment; Thailand

1. Introduction

Palm oil is the most widely used vegetable oil with a global production of about 59.5 million tonnes in 2013/2014 accounting for about 40% of the world major vegetable oils production i.e. palm oil, soybean oil, canola oil and sunflower oil (Statista, 2016; Hansen et al., 2015; Oosterveer, 2015). The worldwide demands for palm oil have increased continuously due to the lower prices as compared to the other oils and its diverse range of uses for both food and non-food products e.g. soaps, cosmetics, oleochemical, plasticizers, detergents and biodiesel