A Study on The Potential of Oil Palm Biomass as Renewable Energy in Malaysia

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Abstract
Biomass wastes from commercial palm oil mills amounts to over 35 million tonnes worldwide, which equivalents to about 65 million barrels of oil. Thus, being one of the largest producers of oil palm worldwide, Malaysia has great potential in utilizing its oil palm wastes as renewable energy. Types of oil palm wastes that can be used to generate energy include empty fruit bunches (EFB), old palm trunks, fronds, roots, fiber, shells and so on. These wastes are generated during harvesting, replanting and milling processes. A study was conducted on selected oil palm plantations and mills and data was obtained on the amount of wastes generated and waste treatment, disposal and utilization methods. EFB was found to be normally used as mulch, fertilizer and sometimes incinerated. Old stems, fronds and roots are used as fertilizers in plantations due to their high nutrient content. Most fibre and shells are utilized as boiler fuel to generate steam and electrical energy. From the study, it was found that the full potential of oil palm biomass in the generation of energy is not being harnessed in Malaysia. The paper will look into reasons behind this problem and outline some suggestions on how to maximize the utilization of biomass energy in the country.

Key word
Oil palm Biomass; Empty Fruit Bunche; Palm fronds; Trunks; Shells; Fibre; Renewable Energy

Introduction
Biomass energy is a type of clean and renewable energy which has a significant role to play in solving the world's energy needs. Biomass combustion is carbon neutral. The carbon dioxide released in the combustion process is recycled by trees and crops which may provide fuel for the future [1]. By utilizing biomass as fuel instead of non-renewable fossil fuels, the net carbon dioxide released into the atmosphere is deemed to be reduced. Biomass is capable of replacing fossil fuels in order to provide steam or electrical energy and generate heat in those areas where it is abundantly available. It gives both economic and environmental benefits, and promotes sustainable development [1].

One type plant that has been identified with high biomass energy potential is the oil palm. The oil palm arrived on the Malaysian shores as ornamental plants in 1887. From an insignificant few acres of oil palm cultivated in early 1900s, the Malaysian oil palm industry today has grown by leaps and now, the country is the largest producer and exporter of palm oil in the world [2]. Malaysia has favourable weather conditions which prevail throughout the year, which is an advantage for palm oil cultivation. Thus it is not surprising that the highest yields have been obtained from palms growing in this region, which is far from its natural habitat in Africa [3].

Palm oil mills in Malaysia produce nearly 12 million tonnes of oil palm per year, which accounts to about 50% of the total world oil palm production. At present, oil palm plantation area of the country totals to about 4 million hectares [4]. These palm oil mills produce huge amounts of wastes annually which have great energy potential. They include solid wastes such as empty fruit bunches (EFB), palm cakes, shells, fibres, palm fronds, stems, roots and etc, and also liquid wastes such as palm oil mill effluent (POME) [5].

Renewable energy derived from biomass wastes such as oil palm residues have good potential in the future. They will continue to compete with conventional fuels like oil, coal and gas. By the year 2020, fossil fuels would have reached a plateau and renewable energy will become significant. The