Role of bioenergy, biorefinery and bioeconomy in sustainable development: Strategic pathways for Malaysia

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Abstract

Malaysia has a plethora of biomass that can be utilized in a sustainable manner to produce bio-products for circular green economy. At the 15th Conference of Parties in Copenhagen, Malaysia stated to voluntarily reduce its emissions intensity of gross domestic product by up to 40% by 2020 from 2005 level. Natural resources e.g. forestry and agricultural resources will attribute in achieving these goals. This paper investigates optimum bio-based systems, such as bioenergy and biorefinery, and their prospects in sustainable development in Malaysia, while analyzing comparable cases globally. Palm oil industry will continue to play a major role in deriving products and contributing to gross national income in Malaysia. Based on the current processing capacity, one tonne of crude palm oil (CPO) production is associated with nine tonnes of biomass generation. Local businesses tend to focus on products with low-risk that enjoy subsidies, e.g. Feed-in-Tariff, such as bioenergy, biogas, etc. CPO biomass is utilized to produce biogas, pellets, dried long fibre and bio-fertilizer and recycle water. It is envisaged that co-production of bio-based products, food and pharmaceutical ingredients, fine, specialty and platform chemicals, polymers, alongside biofuel and bioenergy from biomass is possible to achieve overall sustainability by the replacement of fossil resources. Inception of process integration gives prominent innovative biorefinery configurations, an example demonstrated recently, via extraction of recyclable, metal, high value chemical (levulinic acid), fuel, electricity and bio-fertilizer from municipal solid waste or urban waste. Levulinic acid yield by only 5% wt% of waste feedstock gives 1.5 fold increase in profitability and eliminates the need for subsidies such as gate fees paid by local authority to waste processor. Unsustainable practices include consumable food wastage, end-of-pipe cleaning and linear economy that must be replaced by sustainable production and consumption, source segregation and process integration, and product longevity and circular economy.

Keywords

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KeyWords Plus: PALM OIL MILL; OSCILLATORY BAFFLED REACTORS; RENEWABLE ENERGY POLICIES; SAGO-BASED BIOREFINERY; FEED-IN TARIFF; BIODIESEL PRODUCTION; HYDROGEN-PRODUCTION; FUZZY OPTIMIZATION; BIO-OIL; TECHNOECONOMIC EVALUATIONS

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