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Review of Existing Sustainability Assessment Methods for Malaysian Palm Oil Production

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Abstract

Malaysia is the second largest palm oil producer in the world. Palm oil production contributes to 6.4% of its gross national income and is important to the socio-economic growth of the country. Palm oil is cheap, high-yield and versatile in various applications. However, the Malaysian palm oil industries are facing enormous challenges due to environmental criticism from pressure groups, green consumerism and increasingly stringent sustainability criterion of importing countries. As a result, various assessment methods have been applied to assess the sustainability performance of palm oil production in Malaysia. This paper reviews how the stakeholders define sustainable palm oil, the effectiveness of existing sustainability assessment through tools (e.g. LCA), standards (e.g. ISPO, ISCC) and legislative requirements (RFS2, REDcert) to identify gaps and barriers to achieve environmental, economic and social objectives of sustainable palm oil production. The gaps and barriers identified would be the basis for developing a holistic framework to attain sustainable palm oil production in Malaysia.

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1. Introduction

The worldwide demand for palm oil has been growing over the past few decades at a rate of 7.1% per annum [1]. The versatility of palm oil in various applications has made it one of the top seventeen oils and fats sources in the world [2]. It does not only assist in meeting the demand of edible oil worldwide, but is also used extensively for oleo-chemicals and biofuel production. Most importantly, palm oil is expected to be a promising alternative fuel to slow down the depletion rate of non-renewable fossil fuels. Because of her position as the second largest palm oil producer in the world, Malaysia should thus, endeavor to maintain its continuous palm oil production in a sustainable manner.

Palm oil has been proven as a useful product which had accelerated its commercial operation. This oil is enriched with antioxidants and has beneficial effect on cholesterol level [3]. Its production cost is at least USD 200 per tonne cheaper than rapeseed oil, and is also cheaper than groundnut, sunflower and soybean [4]. This oil supplies 31.3% of global oil and fat

demand in 2011, meeting the needs of 3 billion people in 150 countries [2]. In addition, it contributes to 57% of world vegetable oil exports, which is three times more tradable compared to soybean. The global market has thus become increasingly dependent on palm oil, which is expected to hit a demand of 62-63 million tonnes by 2015 [4].

Malaysia currently accounts for 38.7% of the world's palm oil production. Palm oil industries generated export earnings of MYR73.26 billion or USD22.32 billion in 2012 [5]. The oil palm industries are expected to continue to play a pivotal role to achieve both GNI (MYR178 billion or USD57 billion) and job creation (1.3 million) targets of the Malaysian Government by 2020 [6]. These facts show that palm oil industries are not only inevitable to Malaysia for its socio-economic development but could also contribute to achieve a sustainable solution for the world's food and energy demand.

Whilst palm oil could offer sustainability benefits by improving Malaysia's socio-economic conditions, these industries have been criticized particularly by international pressure groups, including Greenpeace, Rainforest Action

Network and World Wildlife Fund (WWF) for current unsustainable production practices [7]. There is also a green consumers' demand for sustainability assurance.

The intensive farming practices and unplanned land use have led to deforestation, loss of species and social conflict between local community and plantation companies. The application of synthetic chemicals (e.g. pesticide and herbicide) has caused land contamination, soil and water pollutions [8], while the increased dependence on fossil fuel for processing and farming operations resulted atmospheric emissions and fuel scarcity, and the emissions of methane from the anaerobic digestion of organic waste such as palm oil mill effluent resulting global warming impact (POME) [9]. Thus, it raises a question as to how to establish sustainable palm oil industries in Malaysia. In order to address this research question, exiting works both directly and indirectly related to the sustainability assessment of Malaysian palm oil industries need to be reviewed as a basis for developing a holistic approach for sustainability assessment to regain the stakeholders' confidence in the supply chain.

A wide range of research has been conducted by researchers to address the socio-environmental problems in the palm oil industry. This paper reviews these issues, the tools and standards used for sustainability assessment, in order to identify gaps and barriers to achieve environmental, economic and social objectives of sustainable palm oil production.

2. Method of review

This study forms part of a rigorous literature review of supply chain management of the palm oil industry. All level of stakeholders along the palm oil supply chain related to Malaysians' context were identified. Their opinions and findings about palm oil sustainability were reviewed through newspaper and magazine articles, organizations' websites, published surveys, national statistics documents, official reports and papers. Palm oil sustainability assessment methods and tools were reviewed through refereed papers, recent palm oil related directives, legislations and standards. The definitions, methods and tools for assessing sustainable development and sustainability were reviewed, analysed and compared against the findings on existing palm oil industries' sustainability performance.

Papers included were identified from a structured keyword search in the following databases: Elsevier Science Direct, Springerlink, Wiley Interscience, and Emerald Insight. Keywords included "palm oil", "social impacts", "environmental management", "supply chain", "sustainable/sustainability", "environment", "life cycle assessment" and "sustainability assessment". Sources were then selected according to the following criteria:

- Scientific research and official publications from the last 10 years;
- Refereed research articles
- Nationally recognized media publications
- Published in English

Results were then categorised into sustainability issues of Malaysian palm oil production from the triple bottom line

aspects, state of the art sustainability assessment methods of palm oil production, and the weaknesses, barriers in these assessment methods to achieve the sustainability objectives.

3. Review of Malaysian palm oil production

Palm oil has its positive implications to sustainable development but its rapid growth in Malaysia has also led to adverse social, economy and environment impacts.

3.1. Environmental implications

Oil palm could help achieving high land use efficiency as its yield is about 10 times more than other leading oilseed crops[2]. The energy yield ratio of palm biodiesel is 3.53, which is more than double of rapeseed biodiesel [10], and also performs better than other competing oils, including soybean[4], coconut and jatropha[11]. In terms of greenhouse gas (GHG) emissions, a carbon saving benefit of 38% is achievable associated with the replacement of conventional diesel fuel with palm biodiesel [10]. Oil palm plantation also allows agro-forestry and livestock crop integration [12], thus could increase the intensification of land use in Malaysia.

The plantation area of oil palm in Malaysia has increased by 150% over the past 30 years [8]. The fragmentation of forest associated with this man-made monocultures has adversely affected the forest ecological functions and threatens the already endangered species e.g. orangutans, elephants, tigers and rhinos[13]. Land clearing activities for oil palm plantation have been identified as the root cause for forest and peatland fires[7] in Southeast Asia each year, which affect the health of millions people in the region, suffered from pneumonia and other respiratory diseases [14].

Palm oil production has also resulted in increased carbon footprints (life cycle GHG emissions). Drainage and burning of peatland forest for palm oil production alone released about 2 billion tonnes of CO₂ equivalent GHG emissions each year, contributing to 4% of global annual emissions [7]. Besides, anaerobic digestion of organic waste such as palm oil mill effluent (POME) causes methane emissions, which has strong global warming impact [9]. Intensive farming practices associated with the increased commercial operation such as the application of N-fertilizer for palm oil plantation could lead to N₂O emission which is 298 times more powerful than CO₂, potentially contribute to even more global warming than the intended cooling through replacing fossil fuel in biofuel application [15]. As a result, the carbon footprint of palm oil (2.8-19.7 kgCO₂ equivalent per kg of palm oil) is 2 to even 18 times [9] higher than other plant based oil (e.g. 1.2 kgCO₂ equivalent per kg of soybean) [16]. Apart from GHG emissions, the use of pesticide and herbicide is causing land contamination, soil and water pollutions [8].

In general, palm oil is neither carbon neutral nor free from other associated environmental impacts such as climate change, use of fossil fuels, respiratory inorganic, acidification/eutrophication, eco-toxicity etc.

3.2. Social impacts

From the social perspective, palm oil industries offer income source to the rural population, and has created

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