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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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Keywords: Palm oil production; sustainability; sustainability assessment; Malaysia

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

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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 CO_2 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 N_2O emission which is 298 times more powerful than CO_2, 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 $kgCO_2$ equivalent per kg of palm oil) is 2 to even 18 times [9] higher than other plant based oil (e.g. 1.2 $kgCO_2$ 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

approximately half a million employment opportunities and reduced urban migration [5]. About 14% (5.3 million hectares) of the total oil palm planted area in Malaysia were planted by independent smallholders [17]. The involvement of local farmers could potentially play a significant role in poverty alleviation, and improve healthcare and education[18].

On the other hand, the palm oil industries have been found to disregard the rights and interest of the local community - the indigenous people in particular. The indigenous people loss their native customary land to large plantation companies due to bribery given to their village head [19] and promises of welfare and income[13] which were later found breached. On top of that, the community had to carry the debt burden due to unequal profit sharing in the contract. Some plantation sites were also reported of using children as low-paid labours [20].

The conversion of forest to palm oil plantation sites has also affected the livelihood of many indigenous people as 83.3% of them have reduced access to the forest resources and there was a significant reduction in fish stocks due to water pollution[18]. Their traditional customs and cultures are disappearing, and many cultural sites e.g. the sacred ancestral burial ground, were destroyed and replaced by oil palm plantations[19]. These experiences present social inequity, which are predominantly from upstream activities of palm oil production. If palm oil is to be considered as a solution to the world's food and energy needs, intra-generational social issues are equally important for achieving sustainable palm oil production.

3.3. Economic impacts

Palm oil industries stand as the fourth largest contributor (6.4% of gross national income) to the Malaysian's economy[6] and is foreseeable to grow continuously due to its versatility, relatively high yield and low price. An economic concern is that farmers are switching from non- economic crops such as cocoa, rubber and coconut to oil palm [4] which could lead to monoculture economy in Malaysia.

Palm oil companies are also facing business risks and experiencing hurdles to run their commercial operation due to unsustainable production. For example, Greenpeace had forced Nestlé not to buy palm oil from Sinar Mas, an oil palm plantation company and made HSBC dropped their investment from it due to its bad reputation of unfriendly environmental practices[21].

Combined efforts of pressure groups have created critical mass and influenced government agencies to enable industries to source green palm oil through government directives. Rainforest Action Network (RAN) for example, worked with Environmental Protection Agency, U.S. to ensure it excludes palm oil-based biofuels from the federal renewable fuels mandate[22]. The United Kingdom on the other hand, is working towards achieving 100% sourcing of credibly certified sustainable palm oil by the end of 2015 [23]. To qualify for the EU Renewable Energy Directive (RED) Biofuels Sustainability Scheme, where incentive is received from EU member states, EU RED requires biofuel to emit at least 35% less greenhouse gas emission than the fossil fuels since 2008 [24]. Palm oil produced in Malaysia in a business as usual scenario offered only 19% GHG saving which is far less than European and US threshold values[25]. As a result, Malaysia had pledged to keep at least 50% of its land as forest cover in Earth Summit in 1992 and Rio+20 in 2012[26].

Thus it is a challenge for the existing Malaysian palm oil producers to meet these stringent targets to enhance their international trade and commercial viability. The supply chain needs to produce socio-environmentally friendly and yet more productive palm oil to meet the requirements of international treaties, new developments in international trades and green consumerism to be economically sustainable in the future.

3.4. Sustainability of Malaysian palm oil industries

The current scenario of Malaysian palm oil industries neither conforms to the definition of Brundtland [27] nor Diesendorf [28]. According to Brundtland (1987), "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Palm oil industries cause the lack of cultivable land for diverse crops, the loss of biodiversity and environmental footprints during the production processes which could affect the future generation in Malaysia.

Diesendorf (2000) modified Brundtland's definition by incorporating intra-generational equity which is the equity between same generations and also emphasised that ecological and social aspects shall be primary objectives and they cannot be traded off with economy development. The existing Malaysian palm oil industries have been criticized for not addressing intra-generational social equity as the livelihood of local community was affected due to palm oil plantations.

Also the existing palm oil production appears to follow weak sustainability represented by an interlocking diagram (Fig. 1). Firstly, the existing palm oil production is economic-focused rather than ecological focused and trade-offs are made between economic development (i.e. Gross Domestic Product) and environmental quality. The oil palm production can increase GHG sequestration, allow livestock and crop integration and increase income and generate employment, but it is currently causing the disappearance of animal species and cultural values in the forest area. Secondly, these industries started with economic imperatives, rather than considering ecological imperatives before converting forest to oil palm plantation to avoid damaging critical natural capital. Thirdly, intergenerational equity allows substitution of human-made capital for natural capital but does not involve substantial conservation of biodiversity, ecological integrity, cultural diversity and other capital, and the empowerment of the local indigenous community.

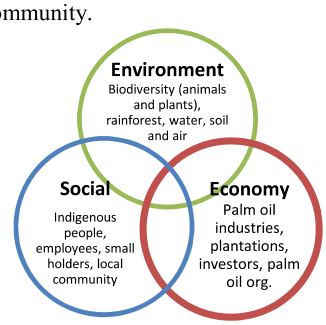

Fig.1: Current Scenario of Malaysian Palm Oil Industries with Limited Commitment of palm oil stakeholders in sustainability

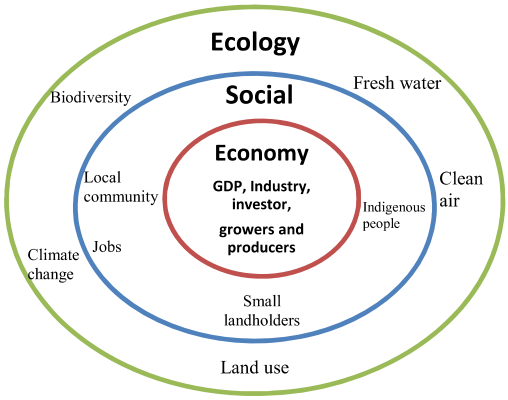

Fig. 2: Sustainable Palm Oil Production

Therefore, a definition has been developed specifically for the Malaysian palm oil industries, which is represented by nested egg diagram (Fig. 2) meaning that ecological limits or constraints are sat on economic activity to avoid damaging critical human and natural capital.

"Sustainable palm oil production is defined as the production that does not cause the loss of bio-diversity, does not increase GHG emissions and associated ecological footprints, does not affect the livelihood of the indigenous people; while enhancing commercial operation, sharing economic growth with the local community through employment and fair trade."

This definition has been used as a benchmark to assess the existing work on sustainability assessment of palm oil production in Malaysia and the framework that will be based on this definition would be able to interpret the interrelationship and interaction between three pillars of sustainability.

4. Review of sustainability assessment of Malaysian palm oil industries

4.1. Definition of sustainable palm oil production by different organizations

The sustainable palm oil definitions provided by green consumers, Malaysian Sustainability Palm Oil (MSPO), Round Table on Sustainable Palm Oil (RSPO) and International Sustainability & Carbon Certification (ISCC) have neither explicitly mentioned inter-generational and intra-generational equity issue, nor taken ecologically driven sustainability approach. None of these aforementioned definitions took into account three pillars of sustainability, and are, therefore, considered as weak sustainability.

4.2. Life cycle assessment

MPOB conducted a full life cycle assessment of the Malaysian oil palm supply chain following the ISO 14040-44 standards in 2006-2010 to provide baseline information on the environmental performance of the industry [29]. Most of the impacts identified are resulting from upstream processes due to lack of environmental management strategies[30]. A major weakness of the life cycle assessments conducted by MPOB is that it only assessed the environmental aspect and it did not include the effect of indirect land use change (ILUC) which potentially has great contribution to the GHG emission. Besides, contribution in impact areas are presented in eco-point unit, quantitative value of GHG emission per functional unit was not published.

4.3. Palm Oil Sustainability Standards/ Certification Schemes

Malaysian palm oil industries began to work with RSPO in year 2004 to promote the growth and use of sustainable palm oil through co-operation within the supply chain and open dialogue between its stakeholders [31]. RSPO is an internationally recognised, membership-based organisation for oil palm growers, processors, trader and consumer goods manufacturers who use palm oil in their products. Through stakeholders' dialogue and voluntary involvement, RSPO introduced RSPO Certification Scheme based on 8 principles, each of which has a list of elaborated criterions [32]. Certified manufacturers may label the RSPO trademark on the products.

Apart from RSPO, there is another certification scheme which was developed by the ISCC. Sustainability requirements of ISCC towards production of biomass include six broad principles [33]. These certification schemes contain broad, general principles that require only a management system to be in place rather than demand for specific sustainability performance. For example, RSPO requires that GHG emissions to be minimised [34] without setting a specific target for achieving international standards.

Until March 2014, only 16% of global palm oil produced are RSPO certified, of which 43.95% are from Malaysia[31] and as of May 2014, 426 ISCC certificates have been issued to oil palm plantation and oil mills which comply with the principles and criterion of the certification scheme[35], covering only a small group of players in the market.

4.4. Trade requirements and Directives of importing countries

The United States' Renewable Fuel Standard 2 (RFS2) requires palm oil to emit 20% - 60% less lifecycle GHG emissions than the conventional diesel to be eligible for a Renewable Identification Number. According to EU RED, sustainable biofuel can neither use land with high carbon stock (wetlands, continuously forested areas, peatlands) nor source raw material from land that has high biodiversity value (primary forest, bio-diverse grassland, nature protected areas) . In addition, a minimum of 35% of GHG saving need to be achieved by replacing fossil fuel. The number is to be increased to 50% in 2017 for current plantation and 60% in 2018 for new plantation[24].

5. Weaknesses of existing sustainability assessment

Despite various efforts made to achieve sustainable palm oil scenarios by both industries and researchers, there are still opportunities to improve the sustainability assessment process by overcoming the existing weaknesses which are as follows:

5.1. Green Design Versus Greenwashing

Whilst RSPO was initiated by the industries to legitimate palm oil to promote its use and development, the objective was actually economic driven rather than sustainability-

focused[36]. RSPO members and executive board are dominated by the industry representatives who perceive sustainability certification as means to ensure business continuity. Palm oil producers holding RSPO memberships, are only stakeholders giving their opinions to the organization but are not necessarily the certified palm oil producers [37]. This often misleads the consumers. Furthermore, the GreenPalm certificates that is endorsed by RSPO, allow companies to purchase the certificates from the RSPO certified growers in the GreenPalm Market. There is an absence of accountability which in some instances could not prevent the companies to procure palm oil from the uncertified growers not complying with the environmental regulations [7, 38]. A palm oil sustainability assessment framework that focuses on achieving sustainability objectives [see section 6], and also strengthens accountability of palm oil industries needs to be developed to truly assess and improve the Malaysian palm oil supply chain.

5.2. Market Share of RSPO Certified Palm Oil growers

The certification schemes like RSPO and ISCC have some inherent weaknesses as these schemes only certify palm oil production from specific plantation areas but not on the basis of overall performance of the plantation company[39]. Hence, plantation companies could have some of their plantations certified to meet the requirements of the EU and US market. The remaining uncertified plantation sites offers cheaper price of palm oil (as certified palm oil will cost 8-15% more than the uncertified ones) to access the Chinese and Indian markets, where sustainability is not criteria for imported items[36]. Hence, a sustainability assessment framework could not only enhance the corporate images of these industries but also could protect the industries' profits and promote green market.

5.3. Choice of sustainability indicators

Even with RSPO certification, the palm oil production is not truly "sustainable" [40]. RSPO's criterion 7.3 requires that 'new plantings since November 2005, have not replaced primary forest', which means deforestation for plantation prior to the commencement date will not be taken into account, and yet certified plantation can trade the palm oil produced from the old plantings as RSPO certified palm oil[39]. Greenpeace[41] investigated that these standards are 'far too weak' as these standards cannot prevent the destruction of forests and peatlands to meet the growing demand for palm oil. The RSPO principles and criteria do not include the banning on peatlands and high carbon stock forests, and without that RSPO standards are not enough for businesses to meet zero deforestation and low-carbon supply targets [42]. A holistic sustainability assessment framework will thus incorporate ecosystem and heritage conservation as criteria for sustainable palm oil production.

5.4. Comprehensiveness of existing sustainability assessment

Current sustainability assessments applied on the palm oil industries are not comprehensive enough to reflect a holistic picture. Life Cycles Assessments along the supply chain have only reflected the environment performance of the industries. Social, economic performances are not evaluated using this method. Besides, there are common weaknesses of the existing LCA on palm oil production. There exists a large uncertainty due to assumptions made (e.g. fixed FFB yield), absence of actual site data for LCA inventories calculation, and the use of generic data which cannot provide representative results for decision making purposes.

5.5. Holistic approach of existing sustainability assessment

Among all, RSPO and ISCC offer relatively a more holistic assessment covering environment, economy and social aspects of sustainability. However, RSPO certification scheme has a lack of environmental and social safeguard as it does not include the Greenhouse Gas (GHG) emissions standards[39]. In addition, there is no adequate specific and quantifiable action for planning, implementation and monitoring to reduce pollution and emissions and also there is an absence of transparently when consulting with growers, mills, smallholders and other local business.

6. The proposed sustainability assessment framework

A more holistic sustainability assessment framework could be structured using the approach followed by IISD (2002) and van Berkel et al. (2008) [43, 44].
According to these approaches, each triple bottom line objective consists of a number of headline performance indicators (HPIs). These indicators are the highest aggregation level for the performance measurement against sustainability objectives. Each HPI is then aggregated into key performance indicators (KPIs) which further describe key impact areas of each HPI with respect to palm oil production that could foster or impede the achievement of each sustainability objectives. The performance measures (PMs), which is the lowest level of aggregation will be established to give quantitative measures for indicators that could contribute to each KPI[43]. The review conducted in section 3, 4 & 5 will provide the basis to discern appropriate HPIs, KPIs and PMs. For example, environmental integrity and benefits could be one of the HPIs for environmental sustainability objectives of palm oil production [45], where the KPIs contributing to this HPI could be biodiversity, air quality, ecological capacity. There are number of PMs for each KPI, for example, the PMs could be number of species and species richness for biodiversity.

7. Conclusions

The review of existing sustainability assessment tools for Malaysian palm oil production pinpoints some shortcomings in their existing framework to assess sustainability of palm oil industries. There is a need of a holistic approach for measuring the right indicators using a comprehensive sustainability framework for the palm oil supply chain, specifically addressing upstream processes of crude palm oil production where most impacts occur. The framework proposed would be able to assess the true sustainability performance for decision making and to provide guideline for improving sustainability performance. The policy makers will be benefited from making strategic decisions and policy formulation which will ultimately restructure the sustainability supply chain of the Malaysian palm oil industries.

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