INTRODUCTION

The Malaysian palm oil industry has experienced significant growth since the crop was first introduced into the country from West Africa in the late 1870s. The oil palm species (*Elaeis guineensis*) was originally planted as an ornamental plant. Since its introduction as an ornamental plant into Malaysia, the oil palm *Elaeis guineensis* has proven to be one of the greatest success stories of the Malaysian economy. From its humble beginnings, the crop expanded to 54,700 ha in 1960. Growth henceforth was dramatic, reaching 1.023 million ha in the 1980s and 2.030 million ha in 1990s. This area expanded to 3.376 million ha in 2000 and had at last count of 4.30 million ha in 2007 according to the Malaysian Palm Oil Board's (MPOB) statistics. Such prolific growth was observed despite the severe contraction of the national economy in 1997/1998 arising from the East Asian financial crisis. The sector also remains as one of the most crucial foreign exchange earners for Malaysia. The total export earnings for palm oil products increased to US$12.56 billion (RM45.2 billion)[1] in 2007 from US$3.25 billion (RM11.7 billion) in 1996. The palm oil has now gained worldwide acceptance due to its unique properties and versatile applications as well as the competitive price over other vegetable oils. Today, palm oil is the leading edible oil traded in world market and is set to be formidable force in oils and fats markets in years to come.

ARE PALM OIL ENVIRONMENTALLY SUSTAINABLE?

The Malaysian palm oil industry has on record some of the best documented practices by any local industry to mitigate and minimize its own

[1] US$1.00 = RM3.60, RM is Ringgit Malaysia

environmental impacts. The Malaysian industry has already for some years now adopted and institutionalized good agricultural and best management practices on their estates. They include widespread use of:

- Integrated Pest Management (IPM) to minimize the use of toxic pesticides through the promotion of beneficial plants, natural enemies and bio-controls like barn owls.
- Recycling and re-use of waste materials from palm oil mills as fertiliser materials, thus minimizing the demand for inorganic fertilisers while maintaining the fertility of soils.
- Zero burning for land clearing and replanting, which has become mandatory in Malaysia
- Planting of leguminous crops as a cover to mitigate and minimize soil erosion.
- Terraced plantings as a soil and water conservation measure.

These various practices have been the culmination of years of industry research and development that have been put to practice.

We believe that the Malaysian palm oil industry is one that has been tightly regulated, with key laws including the conduct of an Environmental Impact Assessment (EIA) study for any new plantations over 500 hectares as well as strict emission levels for both its mill effluents and black smoke, to name a few. Other major environmental laws in place that demonstrate Malaysia's concern for environmental conservation include the Land Conservation Act 1960, Environmental Quality Act 1974, Pesticides Act 1974, National Parks Act 1984, and Environmental Quality Act 1986. Malaysia is also a signatory to the Convention on Biological Diversity 1992, International Tropical Timber Agreement and Charter of the Indigenous - Tribal Peoples of Tropical Forests. This has resulted in an industry that is both compliant and works hard to minimize pollution to the environment, while protecting the rights of the indigenous people and the wildlife in our rich rainforests. The Government of Malaysia's proactive stand on environmental issues has resulted in the creation of a dedicated Ministry of Environment and Natural

Resources reinforced in March 2004 to monitor and lay down new standards and policies with regard to environmental and natural resources management.

There is ample evidence that large areas of oil palm plantation in Malaysia claimed to be under tropical rainforest are actually established on degraded and logged-over forests or have been planted in areas previously cultivated with other perennial plantation crops such as rubber, cocoa and coconut. Almost two thirds of Malaysia is still covered by forest and perennial tree cover (total area under cover of permanent forest reserve - 19.54 million hectares), while the extent of acreage under commodity crops like oil palm, rubber, cocoa and coconuts are 10.20%, 4.30% and 2.20% respectively, resulting in more than three-quarters of Malaysia still being under forest and tree cover.

It is pertinent to highlight that there is no evidence of a threat to wildlife caused by oil palm plantations. On the contrary, being a perennial tree crop cultivated in the tropical areas, there is far greater biodiversity in oil palm plantations than in the case of annual cereals, vegetables and other short-term cropping systems of the world. A typical oil palm plantation is teemed with 268 species of flora and fauna, which include microbes, insects, arthropods, reptiles, fish, birds and small mammals such as the relatively rare leopard cat *Felis bengalalisis*.

Good examples of creating a greater balance between the economy and the ecology within the framework of the plantation ecosystem have long been part of oil palm cultivation in Malaysia. Preserving jungle reserves and wildlife sanctuaries as well as promoting green corridors are common examples of efforts in enhancing biodiversity enrichment widely found in the plantation context. The industry is far better regulated and the orangutan far better protected than is suggested in the report such as in the Friends of the Earth (FoE) report. For example, since 2000, about 27,000 hectares of the flood plain of Kinabatangan, which has a rich and abundant

diversity of flora and fauna have been gazetted as the Kinabatangan Wildlife Sanctuary under the Land Ordinance. The Lower Kinabatangan floodplain is one of Sabah's most impressive natural ecosystems. A recent survey showed that thousands of orangutans remain in and around the protected area. Besides orangutans, the area also contains a rich mosaic of inhabitants such as pygmy elephants, proboscis monkeys, gibbons, Sumatran rhinos and hornbills. Several local agricultural landowners are already collaborating with WWF to plant trees in areas of previously cleared land between forest patches, in order to re-connect forest with intervening tree cover. As the trees grow, wildlife should benefit from greater freedom to move between the forest patches. Working to maintain a balance between the conservation of this unique floodplain and its wise use has been key to the conservation efforts. WWF's project to help conserve Kinabatangan entitled "A Corridor of Life", outlines a strategy that is focused on creating a healthy environment in which agriculture, people and nature conservation co-exist, and work in partnership to achieve significant results of biodiversity protection for all concerned.

Malaysia has long made concerted efforts to ensure the conservation of its biodiversity and natural resources by creating and supporting projects both inland and at sea. Some examples are the Sepilok Orangutan Rehabilitation Center, Turtle Island Reserve, Sipadan Island Reserve and Danum Valley. Sepilok, renowned for its orangutan rehabilitation project has expanded its objectives to include public education on conservation and research on other endangered species.

The overall contribution of the palm oil industry to Malaysia can be seen not just from the economic impact, but also from the perspective of a wider social responsibility such as providing job opportunities, social welfare and modernizing communities on the fringes of development. Often, such contributions are over-shadowed by environmental concerns articulated by activists who disregard the whole macro perspective, or simply by groups and individuals whose limited knowledge of the situation on the ground has

led to misconceived ideas. The challenge for conservation is its successful implementation in the broader context of social and economic development.

As a serious participant in the global market, the Malaysian oil palm industry has evolved over time to be a thought-leader in terms of environmental management. The industry has long championed that a balance can and must be achieved between commercial needs and preservation of the environment, which is the goal for all players in the industry to produce sustainable palm oil.

OVERVIEW OF PALM BIODIESEL

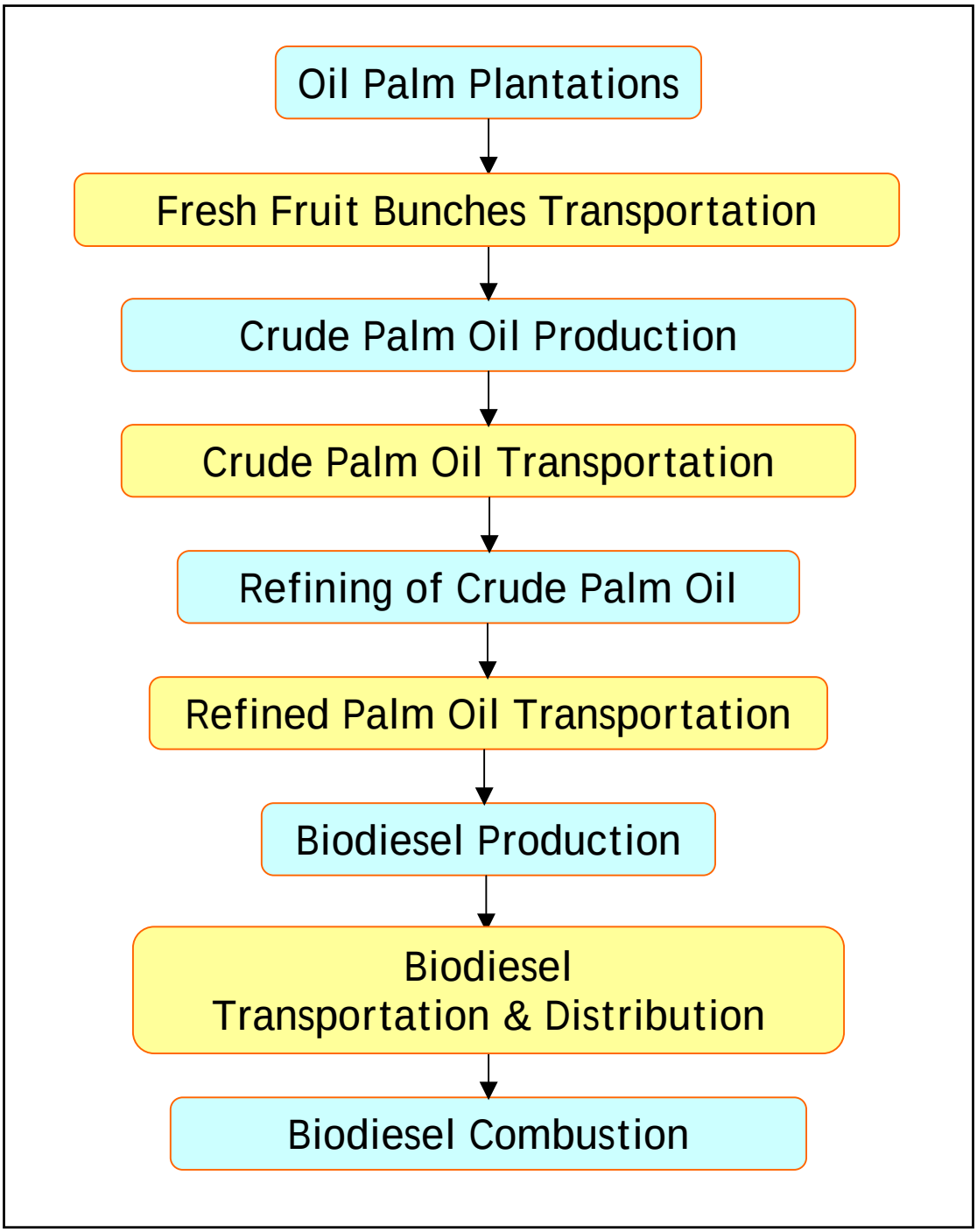

Figure 1: Palm Biodiesel Production, Transport, Distribution and Combustion Pathway

PALM BIODIESEL PRODUCTION PATHWAY

Table 1: Total emission for the production of palm biodiesel

	Emission (g $CO_{2\ eq}$ / MJ)
Oil palm plantations	6.69
Processing	
(1) Without methane capture	29.66
(2) With methane capture	7.95
Transport & Distribution	4.66
Total	
(1) Without methane capture	**41.01**
(2) With methane capture	**19.30**

Table 2: Breakdown emission for the production of palm biodiesel

Oil palm plantations	**Emission (g $CO_{2\ eq}$ / MJ)**
N fertilizer	1.37
P_2O_5 fertilizer	0.17
K_2O fertilizer	0.23
Pesticides	0.78
Diesel	0.90
Emission from field	3.24
Processing	**Emission (g $CO_{2\ eq}$ / MJ)**
Production of crude palm oil	
(1) Without methane capture	21.71
(2) With methane capture	0.00
Refining of crude palm oil	0.63
Transesterification	7.32
Transportation	**Emission (g $CO_{2\ eq}$ / MJ)**
Fresh fruit bunches transportation	0.11
Crude palm oil transportation	0.38
Refined palm oil transportation	0.38
Biodiesel transportation	3.03
Biodiesel distribution	0.76

Assumptions:

1) Two scenarios are taken into consideration for the production of palm biodiesel in Malaysia, viz (1) production of biodiesel without methane capture at the palm oil mills and (2) production of biodiesel with methane capture at the palm oil mills.

2) Fertilisers input used for the calculation of emission from oil palm plantations (Table 3) is based on average values (based on hectarage) obtained from 105 plantations in Malaysia.

Table 3: Fertilizers, pesticides and diesel usage for 105 plantations

Input	I/O	Unit	Amount
N fertilizer	Input	kg/t_{FFB}	3.49
P_2O_5 fertilizer	Input	kg/t_{FFB}	2.8
K_2O fertilizer	Input	kg/t_{FFB}	11.5
Pesticides	Input	kg/t_{FFB}	0.126
Diesel	Input	litre/t_{FFB}	2.37
Yield	Output	t_{FFB}/ha.a	20.5

3) Transportation of fresh fruit bunches, crude palm oil and refined palm oil are based on diesel consumption and trucks available in Malaysia.

4) Biodiesel produced is transported via ship over a distance of 5,500 nautical miles (10,189 km) for distribution (exports).

5) Allocation of co-products such as palm kernel and glycerine are carried out based on energy allocation.

6) The fossil fuel comparator used is 83.8 g $CO_{2\ eq}$ / MJ.

7) The data is still subjected to verification.