Biodiversity in the Oil Palm Plantation

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INTRODUCTION

The Millennium Ecosystem Assessment by United Nations (2005) defines biodiversity as the diversity among living organisms in terrestrial, marine other aquatic ecosystems and the ecological complexes of which they are part. The loss of biodiversity has garnered a significant amount of media and scientific attention both negative and positive in the past decade, with a focus on Southeast Asia and other tropical regions. One of the main reasons of this attention is due to the richer biodiversity in these areas compared to the temperate and arctic regions in the north or south of the equator. The number of species increases at the Mediterranean latitude as the altitude decreases and *vice versa.*

The African oil palm, *Elaeis guineensis,* thrives in a tropical and subtropical climate with temperatures between 22°C and 33°C and evenly distributed rainfall of 1500-2000 mm yr^{-1} making the best natural plantation area within 20° of the equator. Malaysia has utilized the benefits of its unique geographical location and has been cultivating the oil palm extensively for the past 93 years.

Due to the immense economic benefits and contribution of the Malaysian oil palm industry towards eradicating poverty and developing the country, the industry is set to increase production in the coming years. The move to continue the expansion of oil palm plantations in exchange for complex tropical forest systems has been fraught with opposition globally. However, biodiversity conservation and rehabilitation efforts by the palm oil industry have increased significantly in recent years, striving towards a balance of the 3Ps, profit (production increase), people (community), and planet (habitat and biodiversity conservation).

MANAGING BIODIVERSITY IN THE OIL PALM PLANTATION

Biodiversity loss is attributed to the change in land use, fragmentation and isolation, habitat change, introduction of invasive species, over exploitation and pollution (MNRE, 2009). For conservation/rehabilitation efforts to have positive results, each element would have to be addressed.

Fragmentation and Isolation

According to FAO (2010), Malaysia covers a land area of 32.855 million hectares, 13.159 million hectares in Peninsular Malaysia, 7.251 million hectares and 12.445 million hectares in Sabah and Sarawak respectively. As per the figures in *Table 1*, oil palm plantations cover 14.3% of the total land area in Malaysia (MPOB, 2009).

Out of the total land area, Malaysia has designated more than 5 million hectares of its forested land as protected area which covers watersheds, wildlife sanctuary and completely protected forest areas accounting for 15.3% of the land area. Forest cover in Malaysia is estimated to be 19.52 million hectares or 59.5% of the total land area (Convention on Biological Diversity, 2010). The term 'forest', however, is used loosely to include logged forests, production forest such as pulp plantations and rubber estates. For example, in the classification of forest reserves by the Sabah Forestry Department,

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TABLE 1. OIL PALM PLANTED AREA 2009 (ha)

Year	Peninsular Malaysia	Sabah	Sarawak	Total	Percentage (total land area)
2009	2 489 814	1 361 598	839 748	4 691 160	14.29%

Source: MPOB (2009).

forest reserves can be categorized in seven classes of permanent reserve forests (PRFs); Class I (protection forest), Class II (commercial forest), Class III (domestic forest), Class IV (amenity forest), Class V (mangrove forest), Class VI (virgin jungle forest) and Class VII (wildlife reserve). Land use change emerging from commercial agriculture and urban development has increased fragmentation and isolation of the forest areas.

Biological and wildlife corridors play an indispensable role in biodiversity conservation by linking protected areas into a mosaic of networks around or through agricultural land and urban areas. Ecological processes such as nutrient cycling, water flow and animal movement can be maintained if habitat patches, corridors and riparian zones are designed appropriately (Reza and Abdullah, 2010). Connectivity is achieved by strips of retained or rehabilitated habitat between habitats fragmented. The width of the corridor depends on the biological purpose of the corridor, the behaviour of target species (types of species and movement patterns), structural connectivity (length of corridor) and edge effects (on the targeted flora/fauna). Riparian corridors can also contribute substantially to connectivity between reserves and fragmented habitats.

Pollution Mitigation

Riparian reserves in oil palm plantations provide ecological, environmental and economical benefits. In terms of economical benefits, riparian reserves provide a natural mitigation system for run-offs and erosion, groundwater and solubles, and sediments and contamination. Run-off velocity is reduced, water and dissolved nutrients (fertilizer run-offs) are taken up by riparian vegetation, consequently promoting the integrity of the aquatic ecosystem. Expenditure on filtration systems and bank stability rehabilitation can be reduced significantly.

This natural pollution control mechanism vastly benefits the riverine environment by promoting a stable habitat for the aquatic and riverine flora and fauna. In terms of its contribution to biodiversity conservation, the riparian reserve can act as a buffer zone in the landscape, and can provide dispersal corridors for terrestrial and aquatic wildlife.

Recommendations on riparian zone width varies widely, however, it boils down to the purpose of the riparian zone and on the land use behind the riparian zone. The Department of Irrigation and Drainage (2010) in their *The Guidelines for Rivers and River Reserves* specify widths of river reserves to a maximum of 50 m, based on the width on the river; however the purpose of the guidelines is mainly for bank stabilization (to avoid soil loss). Riparian zones as biodiversity habitats/corridors or water quality improvement (prevention of fertilizer and pesticide run-offs), require greater widths in general (MNRE, 2009). Sabah Water Resources Enactment (Section 20) recommends a baseline width of 20 m; this is for preventing the degradation of the quality of water resources and damage to the aquatic environment in water bodies.

In order for a riparian zone to function as wildlife habitats/corridors, there are several key requirements for biodiversity: a variety of suitable flora species is required, suitable vertical stratification, continuity of canopy cover, availability of nesting material and sufficient width needs to be ensured. Riparian zones applied as a buffer to filter pollutants; depends on amount of pollutants, type of pollutants and pathways of pollutants.

CONCLUSION

The last decade has seen a sharp increase in the focus on the oil palm industry and biodiversity loss particularly in Southeast Asia due to the highly complex biodiverse ecosystem. Media exposure and increasing acceptance as well as awareness of climate change and its correlation to the extinction of species – and ultimately impacting human welfare - has been a catalyst to instigate more efficient conservation efforts. The oil palm industry fuelled by global pressure has heightened its efforts to balance productivity, profit and biodiversity conservation but lots remain to be done in the sector to become environmental sustainable.

ACKNOWLEDGEMENT

The author thank the Director-General of MPOB for permission to publish this article and Dr Carl Traeholt for his input in this article.

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