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INCIDENCE OF HIGH FFA FEEDSTOCK FROM THE OIL PALM INDUSTRY: A NICHE AND INTERMEDIATE OPPORTUNITY



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Introduction

- About 20 countries are involved in oil palm cultivation worldwide. Among them, Malaysia, Indonesia, Thailand and Nigeria are 4 significant producers of palm oil, accounting for more than 80% of world palm oil production.
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- Between 80-90% of palm oil used as food and 10-20% used in non-fuel applications (oleochemicals & biofuel). In this respect palm oil has to compete with 16 other oils and fats for its market share.

World Crude Palm Oil – CPO Production

World Crude Palm Oil – CPO Production			
	Million Tons		
	1997	2007	% Growth /Y
Malaysia	8.51	15.80	8.57%
Indonesia	5.00	15.90	21.80%
Thailand	0.30	1.00	23.33%
Nigeria	0.50	0.81	6.20%
Columbia	0.39	0.77	9.74%
Others	2.27	2.55	1.23%
	16.97	36.83	11.70%

SE ASIAN ARCHIPELAGO



Rapid Expansion & Logistical Issues

- In Malaysia alone oil palm cultivation in 2008 took up 4.48 million hectares, with a slightly larger hectareage in Indonesia of over 5 million hectares expanding at a rate of over 300,000 - 500,000 hectares every year. This has been reflected in the CPO poduction growth rate in excess of 20% in Indonesia since 1997.
- With limited land area of not more than a million hectares to expand further in Malaysia, the focus has been to increase plantation yield productivity and processing efficiency reflected in the average national CPO yield per hectare of 4 tons/hectare; the highest in the world.
- This has been aided by 4 decades of investment in the industry infrastructure including plantations, oil mill capacity in a relatively compact area of Peninsular Malaysia, Sarawak and Sabah.

Smallholders vs Mill Capacity

- Smallholders account for a substantial proportion of the world's oil palm. Between the two countries that dominate world production, Malaysia and Indonesia, smallholders are responsible for 37-40% of the total area under oil palm.
- Oil palm fresh fruit bunches must be milled within 24 hours of harvest to avoid deterioration in quality.

Smallholders vs Mill Capacity

- Thus all smallholders must deliver their harvest rapidly to a nearby mill. In practice this often necessitates a close relationship, sometimes contractual, with the company or government agency that owns the only mill within delivery distance.
- It is widely accepted that the nature of these arrangements has a direct bearing on the type and direction of environmental and development impacts associated with palm oil production.

Area Under Smallholders

Country	Annual national production*	Area under smallholders	National production from smallholders	Source and year
Malaysia	13,976	1.37 million ha; 40% of total**	11% from independent smallholders	MPOB 2003
Indonesia	12,100	1.81 million ha; 37% of total**	33%	Gov of Ind 2003
Nigeria	790	1.65 million ha (semi-wild or intercropped)	80%	WRM 2001
Colombia	632	< 100,000 ha		FEDEPALMA 2003
Papua New Guinea	345		50%	NBPOB 2006
Cote d'Ivoire	270	135,000 ha; 70% of total (up from 40% in 1980s)		FAS 2002; WRM 2001
Brazil	140		Perhaps 3-4%	Agropalma 2006

* In thousands of tonnes; Oil World Annual figures for 2004-5

** Figures include both supported and independent growers

Mill Capacity Gap

- Compared to Malaysia, given the rapid expansion of oil palm hectareage in Indonesia in the last two decades, investment in industry infrastructure especially in oil milling has been struggling to catch up with fresh fruit bunch production.
- This has been especially the case as planting is extended further eastwards from Sumatra and Java towards the more logistically challenged areas of Kalimantan, Sulawesi and Papua. The road networks are poor and in certain remote areas most transport for fruit bunch delivery is riverine.
- As a direct result, there is a high incidence, largely unreported officially, of fresh fruit bunches not harvested in time and delivered to the mill within 24 hours to avoid the build up in the Free Fatty Acid (FFA) levels.

Mini Mills

- In addition, mill capacity is sometimes not sufficient to cater to the smallholder production as priority is given to the production from the plantation which usually owns the mill.
- Even then, within the plantation, during certain peak seasons occasioned by excessive rainfall, complete evacuation of the overproduction of fresh fruit bunches become impossible and they are practically discarded and buried.
- This state of affairs has resulted in the emergence of mini-mills sometimes operating on barges, which process oil palm fruit bunches that are less than day fresh resulting in High Free Fatty Acid Crude Palm Oil (HFCPO).

Interim Incidence of High FFA Oils

- The practical time limit for crushing fruit bunches is about two weeks before they deteriorate due to fungus and decompose into a soggy mass unsuitable for oil expellation. As such they are considered waste products from oil palm plantations which do not enter the food processing chain.
- Although the incidence of such waste products is less in Peninsular Malaysia due to better organizational efficiency and logistics among the plantation companies and smallholder development agencies, there are isolated cases in Sarawak and Sabah of unprocessed fruit bunches especially when CPO prices are low.

Papua New Guinea: Abandoned Plantations

- There are cases in Papua New Guinea of neglected oil palm plantations which have been established by timber companies as a condition for securing logging concessions but which have not been supplied with an oil mill, merely because it was not stipulated.
- Smallholders who have planted oil palm are also not sufficiently supported by a oil mill and as it is there is a backlog of sufficient oil milling capacity in Papua New Guinea

Niche and Intermediate Opportunity

- The niche and intermediate opportunity of available HFCPO is presented by the situation where there are currently logistical and operational impediments to optimal food processing requirements.
- The fruit bunches would be wasted anyway. In this case, the food or fuel argument does not apply and the obvious solution would be to install sufficient capacity but that would take at least a decade before efficiency in Indonesia and Papua New Guinea reaches the level of that in Malaysia.

Benefits to Smallholders

- As small holders are often affected by such issues, they stand to benefit from the mopping up of such waste products to be processed as HFCPO and to be further processed into biodiesel for export markets.
- In as far as the smallholders or plantations comply with land use criteria, such products should meet sustainability requirements. When the FFA levels rise beyond what is acceptable for food, the feedstock can still be used for biodiesel production.

Oil Palm Waste Oils

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- EF = Empty Fibres from the current Palm Oil Mill process after separating the Palm Kernels.
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- EFB = Empty Fruit Bunch from the current Palm Oil Mill process after separating the Palm Oil Fruits from the Fruit Bunch behind the thresher.
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- Sludge and Effluent Oil = Oil from the sterilizer Process, residual oil in the waste water & Oil from the Filter Press cake or Decanter Sludge.
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- High Fatty Acid Crude Palm Oil = byproduct non-food grade oil produced from loose fruit and overripe fresh fruit bunches.
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- Storage Tank Waste Oil which accumulates below heating coils.
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- Used Cooking Oil from restaurants, hotels, and

- In addition to HFCPO, there are other sources of waste oil from the palm oil production process at the milling phase.
- Solvent based extraction has never been deployed for oil palm as it is too expensive and there is residual oil in the Empty Fibres (EF) as well as the Empty Fruit Bunches (EFB). The Mill process also yields sludge and effluent oil as well as storage tank waste oils.
- These categories of waste oil are continuously generated but are otherwise wasted as they go straight into the incinerator as part of the solid fuel if not extracted.

Processing Empty Fibre / Empty Fruit Bunches

- Oil palm mills currently use the empty fruit bunches and the empty fibre (metacarpal) as boiler fuel, which helps reduce operating costs. The mills use diesel as an additional fuel for boilers as well as for transport and generators.
- With the utilization of a proprietary expeller recently made available it is possible to extract from the EFB and EF a minimum of a further 1% of residual oil by Fresh Fruit Bunch weight which is of a sufficient quality to provide biodiesel suitable for use in the mill and in fleet transport.
- A 90 ton per hour mill would have up to 5,000 tonnes annually of residual oil that could be extracted. The advantages to the mill operator are the self-sufficiency that the mill achieves in its diesel requirements without losing the EFB and EF as boiler fuel.
- There is little calorific loss as moisture levels are also lowered and the pressed EFB and EF fuel will burn as efficiently as before. The mill owners will be demonstrating an ecologically sound fuel policy and making their operations more efficient from non-food feedstocks.

Estimated Available Quantities in Indonesia

Estimated Available Quantities Palm Oil Feedstocks – 2008	MT/year (in millions) Bio-oil or Bio-diesel Feedstock
Crude Palm Oil (CPO)	18.50
Palm Kernel Oil (PKO)	3.78
High Fatty Acid Crude Palm Oil (HFCPO)	0.67
Sludge Oil	0.22
Waste Fiber Oil	0.28
Empty Fruit Bunch Oil	0.37
Storage Tank Waste Oil	0.11
Recycled Cooking Oil	0.45
Total Waste Palm Oil Feedstocks	2.10
Estimated Recoverable from Unharvested FFBS	1.16

Conclusion/Opportunities

- In Thailand, mini-mills are also established to press the whole oil palm fruit including both the mesocarp and the kernel to produce a high FFA combined palm and palm kernel oil which is used for both food and biodiesel production. Opportunities exist to invest in dedicated oil palm plantations in Thailand and neighbouring countries fulfilling sustainability criteria.
- In Indonesia, the logistics exercise of organizing collection of HFCPO from mini-mills or even the processing of waste fruit bunches itself for pressing represent an opportunity for conversion of this waste resource into fuel.
- In Malaysia, the use of other waste products such as residual oil from the EF and EFB, sludge oil, storage tank oil remain viable investment options. In a number of locations worldwide, waste cooking oil has always been an attractive feedstock for biodiesel processing; its only limitation being collection and availability

THANK YOU !!

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