



ENERGY

Palm Biodiesel- A Cost Effective Environment Friendly Fuel

U.R.Unnithan, Carotino Sdn Bhd

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Presentation Outline

- The Global Scenario
- Why Palm Biodiesel?
- The MPOB Initiative
- Malaysian Bio-diesel Scenario
- Palm Bio-Diesel- Challenges, opportunities and Risks
- Palm Bio-Diesel- The Way forward

The Global Scenario

- Global Energy demand is expected to grow by 50% by 2030
- Transport sector would remain the main driver for increase in energy demand

The Global Scenario

- 2% of Global Diesel Fuel Substitution would require 50% of Global oils & fats
- German Bio-diesel capacity has increased from 65,000 mt in 1995 to 2.35 M mt in 2005 and is currently 4.0 M mt.
- Rapeseed Oil is the main feedstock for Bio-diesel in Europe and Soya Oil is the main feedstock in the US.
- EU Directive: Use of Biofuels -2% by 2005 and 5.75% by 2010. The EU parliament is now working on increasing this to 10%
- EU market built around Subsidies
- There is a great push in the USA with US\$1/gallon tax incentive
- Brazil & Argentina have also embarked on an aggressive Biodiesel program
- Malaysia & Indonesia have taken the lead in Asia

U.S Biodiesel Scenario

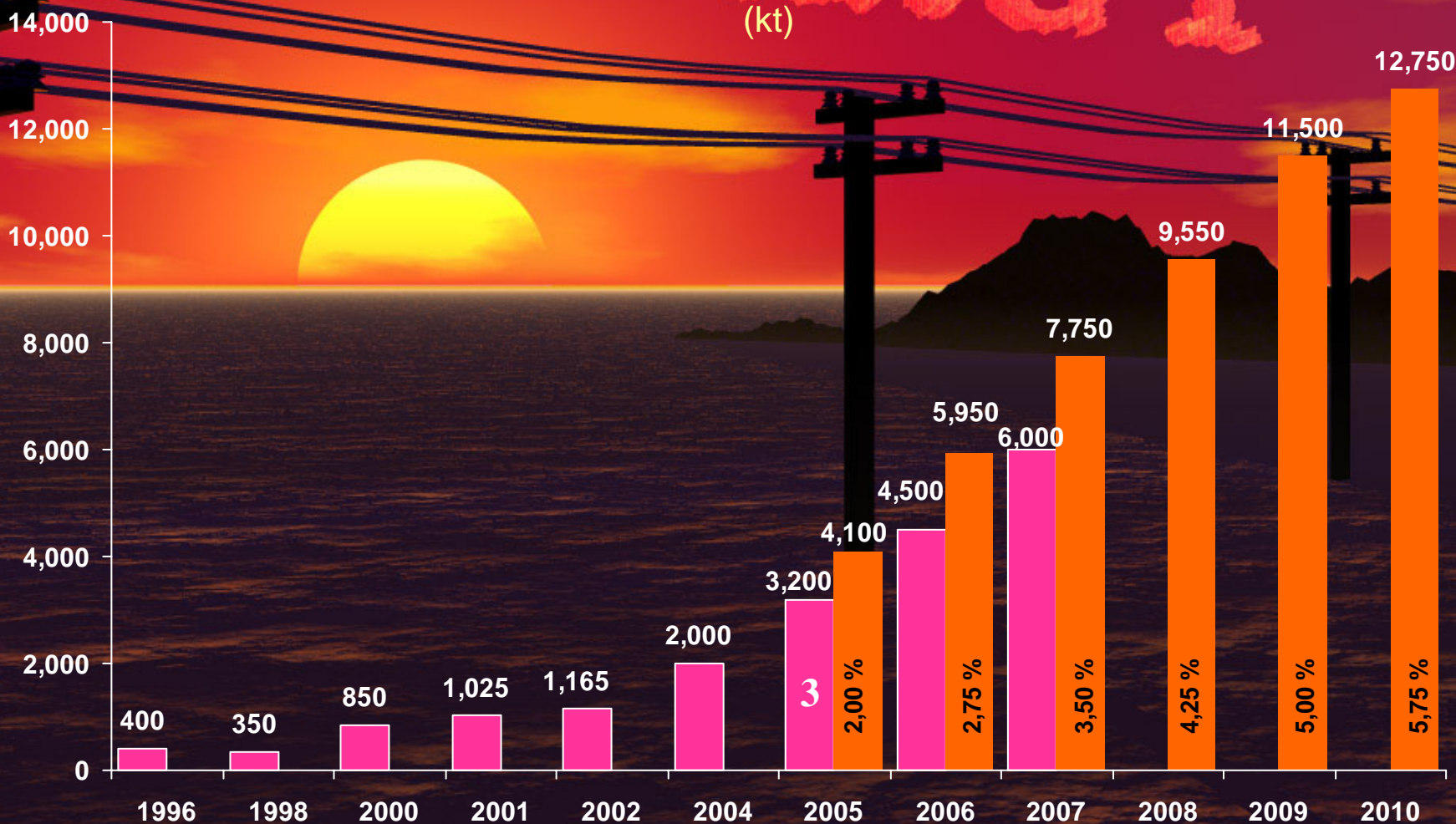
- Seeing a rapid growth in Biodiesel consumption – from 0.5 Million gallons in 1999 to 75 Million gallons in 2005 and expected to grow to 650 Million gallons by 2015
- App. US\$810 M investment in Biodiesel plants will be required to match the demand between 2006 & 2015

Source: National Biodiesel Board, USA

Biodiesel EU-Production/Consumption

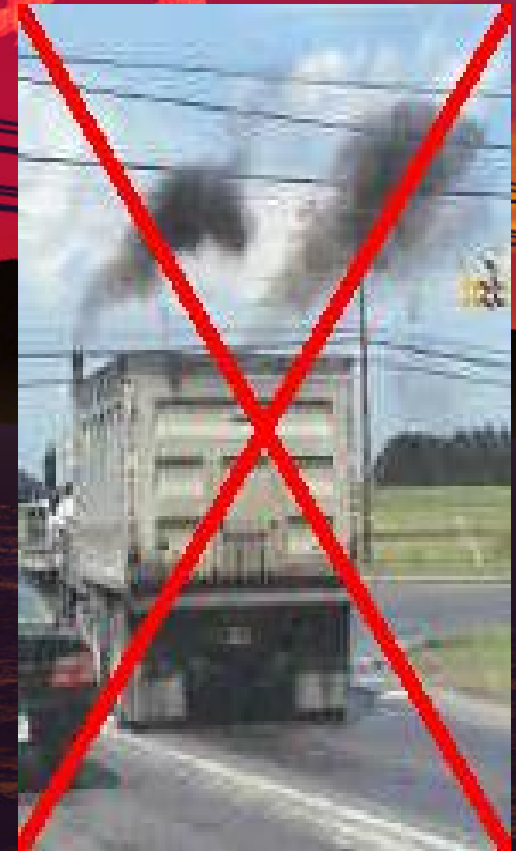
Compared to targets set by the EU

(reduced to diesel consumption only)



Why use Palm Biodiesel and Palm Biofuel

- Made from renewable resources
- Biodegradable
- Can be produced in short amounts of time
(for example: one growing season)
whereas nonrenewables, like fossil fuels, take 40 million years or more to be produced.
- Reduces emissions of carbon monoxide (CO) by approximately 50% and carbon dioxide by 78.45% compared to petroleum diesel
- Free of Sulphur



Why Choose Palm for Biodiesel?

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- Palm oil is the most productive oil bearing plant species.
- The yield of Palm Oil per unit area is 5 and 10 times higher than rapeseed and soybean respectively.
- Palm oil is less susceptible to the vagaries of the weather



MALAYSIAN PALM BIODIESEL STORY

- Malaysian Palm Oil Board (MPOB) commenced the Palm Biodiesel R&D Project in 1982.
- Production Technology for Methyl Ester
- Evaluation as Diesel Substitute
- Low Pour Point Palm Diesel (Winter Fuel)
- Recovery of Co-Products: Phytonutrients
- Commercialization of R&D findings



***Palm Diesel Pilot Plant at MPOB
(3,000 tonnes per year)***

EXHAUSTIVE ENGINE FIELD TRIAL

PHASE I : 1986- 1989

31 engines of various makes

- | | |
|--------------------|-----------------------|
| 1. Garbage trucks | 7. Land cruiser |
| 2. Lorries | 8. Cars |
| 3. Army trucks | 9. Water pump |
| 4. Taxis | 10. Vans |
| 5. Mini-tractors | 11. Stationary engine |
| 6. Generating sets | Testbeds |

EXHAUSTIVE FIELD TRIAL (cont.)

PHASE II : 1990 - 1994

- ❖ Stationary engine testing by Mercedes Benz
- ❖ 36 Buses mounted with Mercedes Benz engines
- ❖ Fuel Test
 - 100% palm diesel
 - 50% palm diesel + 50% petroleum diesel
 - 100% petroleum diesel (as control)
 - Each bus covered 300,000 km.
 - No modification of diesel engine required.
- ❖ MPOB vehicles
 - Fuel tested: 100% crude palm stearin methyl esters



Field Trials using Mercedes Benz (OM352) Diesel Engines Mounted on Passenger Buses (Each bus covered 300,000 km)

SUMMARY OF FIELD TRIAL

- No modification of diesel engine required.
- Good Performance of engine : easy starting, no knocking, smooth running
- Cleaner exhaust gas emission :
 - reduction of hydrocarbon(30%), CO(20%), (74%)CO₂,(99%)SO₂ content.
 - More environmentally friendly.
- Engine oil: still usable after recommended mileage.
- Cetane number / Diesel Improver
(62.4 compared to 37.7 for petroleum diesel from Europe)
- Lower Ignition delay

TRIALS OF PALM BIODIESEL ON COMMERCIAL TRAINS



***Trials conducted by Prignitzer Eisenbahn (PE)
Arriva in Germany, since September 2004.***

Extraction of Nutraceuticals

Crude Palm Oil (CPO)



CPO Methyl Esters
(Palm Bio Diesel)



Distillation



Distilled Methyl Esters
(Palm Bio Diesel)

Excellent Quality
Biodiesel &
Feedstock for
value-added
oleochemical
products



Phytonutrients Concentrate
Containing Carotenes, Vitamin
E, Phospholipids (Lecithin),
Sterols, Coenzyme Q and
Squalene

Carotenes
Vitamin E
Sterols
Squalene
Coenzyme Q
Phospholipids
(Lecithin)



A sunset scene over the ocean. The sun is a large, bright yellow circle on the horizon. The sky is a mix of orange, red, and purple. In the foreground, there are several black power lines and poles stretching across the water. In the background, there is a silhouette of a mountain range.

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Current Malaysian Bio-diesel Scenario

Bio-diesel Licensing in Malaysia

Date	Applied	Approved	Capacity, mt
July 2007	>100	92	6,000,000(potential)
Dec 2004	3	3	18,000
Dec 2002	2	2	6,000
Dec 2000	1	1	3,000

Currently about 1,000,000 mt/yr capacity set up

Bio-diesel Experience

- First MPOB Technology based pilot plant built in 2002- primarily for Neutraceutical extraction. Palm Methyl Ester was a by-product then!!!
- Stabilized pilot plant and started commercial production by August 2002(3,000 TPA)



Carotino PME Pilot Plant

The MPOB initiative

- MPOB awarded licenses to build 3 x 60,000 mt/yr Palm Biodiesel Plants in December 2005
- Carotino, Golden Hope and FIMA selected to build the 3 plants
- Construction of the first plant at Pasir Gudang, Johor started in December 2005 and was completed by May 2006

The World's First Integrated Palm Biodiesel Plant.

- MPOB together with Carotino commercialized The World's First Integrated Palm Biodiesel Plant by end June 2006.
- The Honourable Prime Minister of Malaysia Dato' Seri Abdullah Haji Ahmad Badawi officially opened the Plant on Aug 15, 2006
- Bulk Shipments started in Aug 2006



Winter-grade Palm Diesel Technology

- MPOB developed technology for -15°C to -21°C CFPP palm diesel.
- Inputs from Pilot Trials proved to be crucial for large scale plant optimization

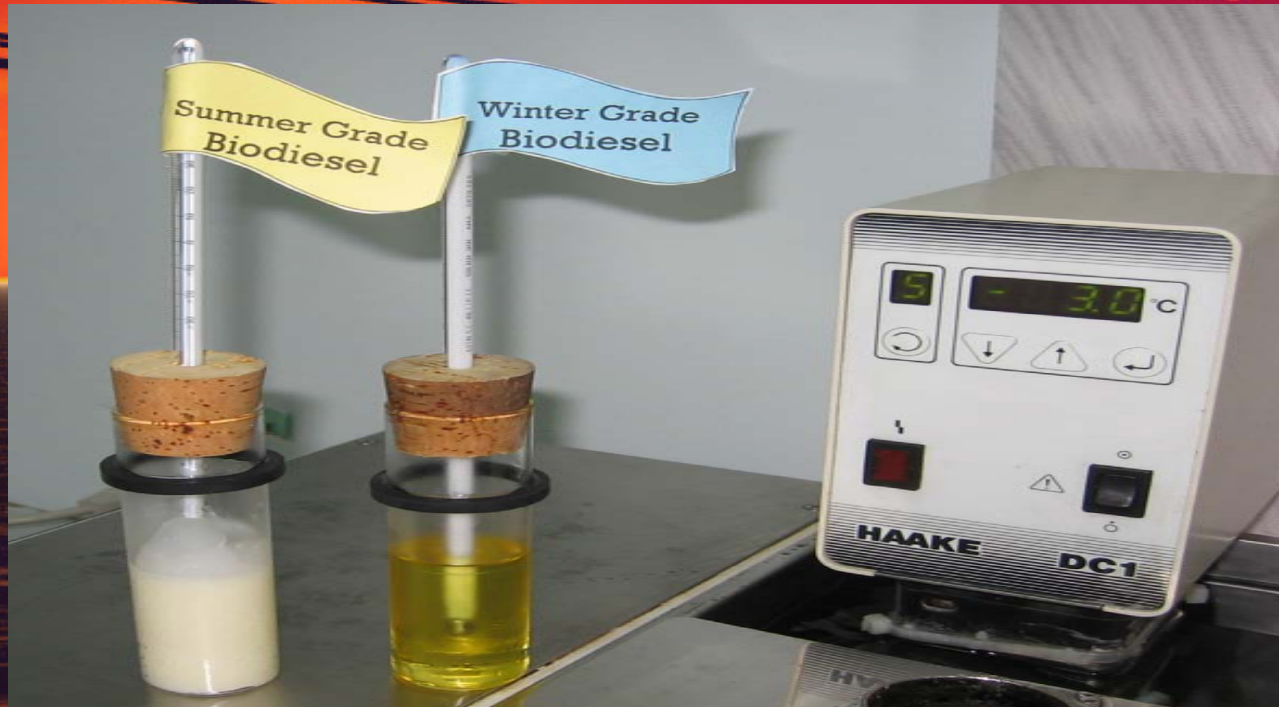
30,000 TPA Winter Grade PME Plant

- Winter grade plant successfully commissioned in July 2006
- Commercial shipments started in Nov/Dec 2006
- This is the world's first such facility



**MPOB/Carotino 30,000 TPA
Winter-grade PME Plant**

Regular & Winter Grade PME



Commercial Winter Grade Palm Biodiesel



Change in market conditions

- In June 2006, CPO was RM 1400/MT and Crude Oil US\$78 per barrel. Profitability around US\$60-100/MT of PME
- In August 2007, CPO is > RM 2500/mt and Crude Oil is around US\$70 per barrel
- The US\$/RM Exchange was 3.8 in June 2006 and it is around 3.49 in August 2007
- Overall impact has been very negative on profitability of the Palm Biodiesel business. In the current market conditions PME producers will lose US\$120-180/MT

Palm Biodiesel-Technological Challenges

1. Technological Challenge

- Meeting Stringent EN14214/ASTM D 6751 Specs
- High CFPP
- Technology Risks-cheaper and better technologies

Technology Opportunities

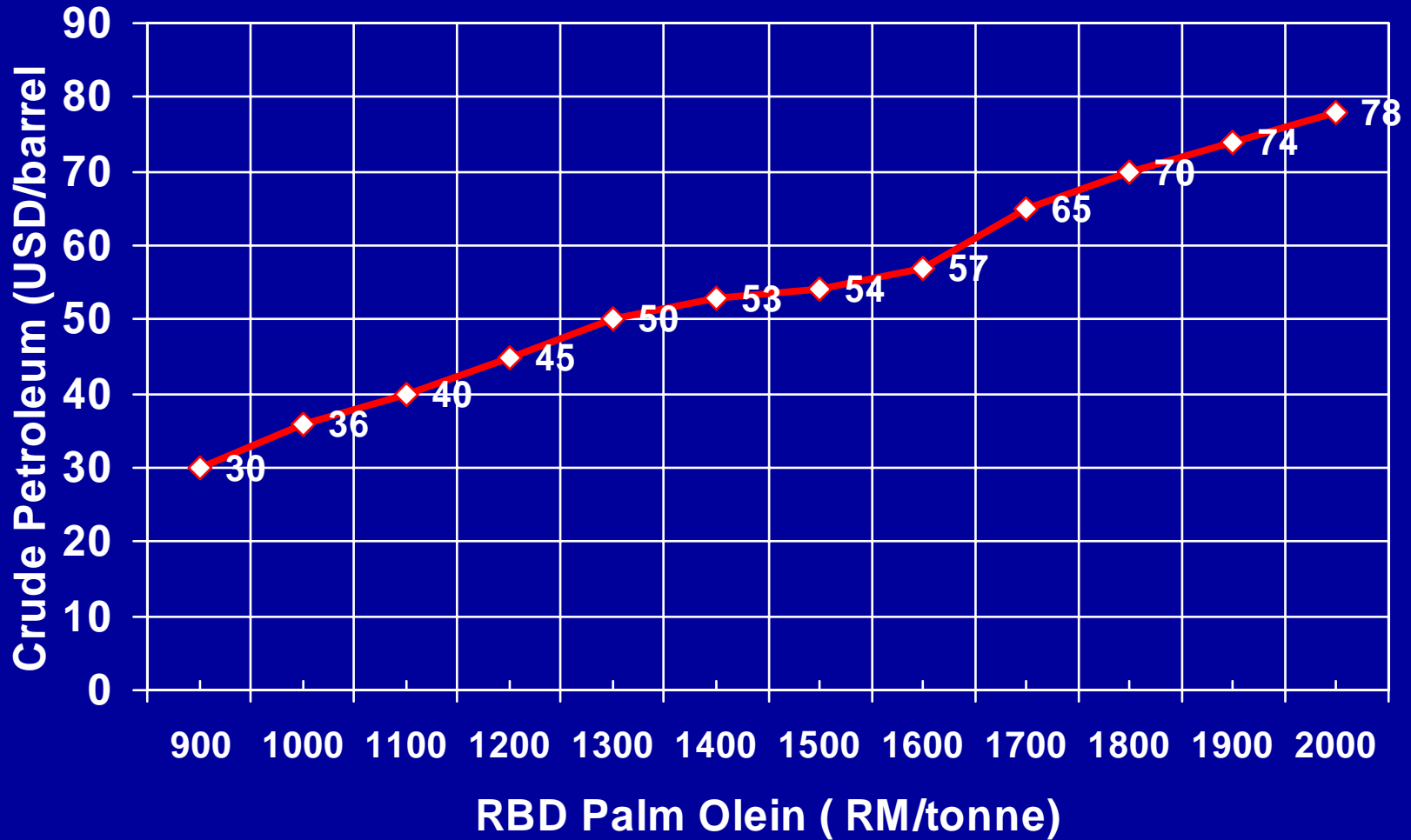
- Raise the bar on quality even further
- Higher oxidative stability of Palm Bio-diesel to be capitalized
- Winter Grade Technology to be harnessed for global reach
- Improve manufacturing efficiencies through innovation

Palm Biodiesel-Marketing Challenges

2. Market Risks

- Fluctuating Crude Oil & CPO prices
- Cheaper sources of raw material- Jatropha
- Change in Specification
- Overcapacity-dumping of Prices
- Raw material availability
- Foreign Exchange Risk

COMPETITIVE PRICES OF RBD PALM OLEIN & PETROLEUM

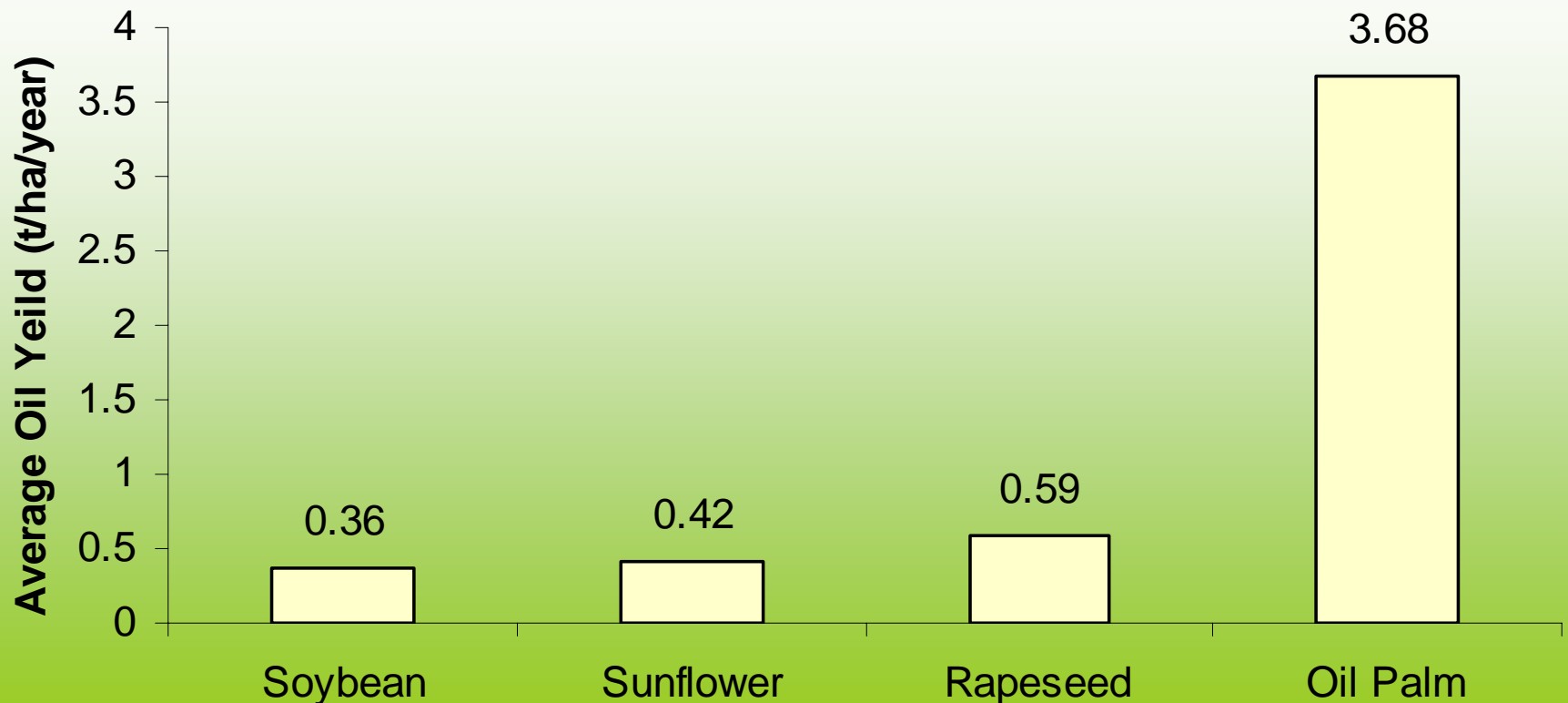


Palm Biodiesel- Marketing opportunities

- Take advantage of Palm's competitiveness as the highest yielding oil crop by leveraging on vertical integration
- Differentiate through Branding and value addition
- Develop tailor made new applications to extend usage from traditional uses
- Develop a local market to avoid Forex exposure

Sustaining the Earth

Oil Palm vs Other Major Oil Crops



Source: Malaysian Palm Oil Council, Oil PalmTree of Life, 2006

Palm Biodiesel-Environmental challenges

- Issue of Sustainability
- Negative image for Palm Bio-diesel- alleged destruction of rain forests
- Food vs. Fuel debate



Palm Bio-diesel-Environmental Opportunities

- Present the facts on Malaysian Forest management
- Popularize the facts on Malaysian Oil Palm Plantations as a planted forest
- Increase domestic usage of Palm Bio-diesel to justify our role in reducing GHG emissions

The concept of the Planted Forest

- Rain forests are not being destroyed for oil palm cultivation at the expense of wildlife habitats
- Some 64% of forest, including some of the oldest virgin rain forests remain intact
- Together with agricultural tree cover(Oil Palm & rubber)- 83% of Malaysia's land mass is green
- 4.05 million ha out of a total of 6.2 million ha used for food and economic crops is Oil Palm

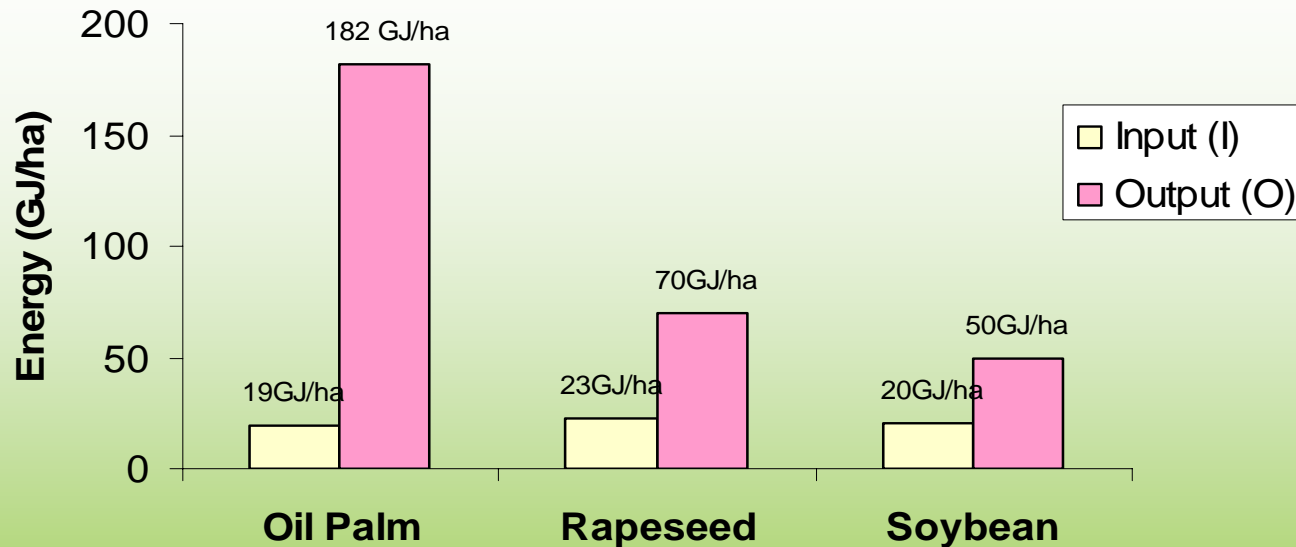
Forest Areas in Selected Countries

Country	% Forest Area	Total Forest Area (mil ha)	Total Land Area (mil ha)
France	28.3	15.55	55.01
Sweden	66.9	27.53	41.16
Germany	31.7	11.08	34.9
Malaysia	63.6	20.89	32.86
UK	11.8	2.85	24.09
Brazil	57.2	477.7	835.56
Argentina	12.1	33.02	273.67
USA	33.1	303.09	915.89
Denmark	11.6	0.5	4.31

Source: FAO, Global Forest Resource Assessment 2005

Energy Balance for Palm, Soybean & Rapeseed Oils

Oil palm is the most efficient crop, with the highest energy output:input ratio



O/I	Oil Palm	Rapeseed	Soybean
GJ/ha	9.6	3.0	2.5

In absolute terms, oil palm also requires the lowest input of pesticides, fertilizers and fuel for unit production of oil.

Palm Biodiesel-Political Challenges

- Can EU subsidies for Bio-diesel be sustainable?
- German Govt. has already imposed from Aug 2006 €0.1/litre tax on BD 100 and €0.15 on BD blends
- Increase in tax on BD 100 by €0.09/litre every year until the tax reaches the full €0.45/litre imposed on petroleum diesel has already been imposed.
- A second round of tax increase on biodiesel is due to be imposed in Jan 2008(Reuters, July 4, 2007)
- 55% of German Biodiesel capacity is currently idle. Sales of B100 in the B100 market have almost totally stopped in Germany.(Reuters, July 4, 2007).RME industry already “ Fears Death in Stages”.
- Tariff/Non Tariff Barriers on Palm Diesel to protect domestic markets in EU & USA?
 - USA imposes 4.6% import duty on Malaysian PME whereas Indonesian PME is duty free.
 - B99 exports from USA seriously affecting both PME & RME producers.
 - Several new restrictions being planned based on sustainability issues.

Political Opportunities

- Ideal environment for Malaysia to take a lead in Asia in implementing mandatory Biodiesel usage
- Malaysia needs to consider establishing guidelines along the US/EU model.
- Establish Malaysia as a center of excellence for Palm Bio-diesel application
- Collaborative efforts in Asia to improve Energy Security just like the EU and US initiative

Palm Biodiesel-The Way Forward

- Establish a global reputation for palm biodiesel by mandating its use in Malaysia and establishing commitment to combat GHG emissions
- Benchmark technology and economical aspects of Biodiesel production with latest developments in the field around the world.
- Meet the most stringent Global Specification for Bio-diesel and improve on it.
- Maximize value addition of by products- Carotenes, Vitamin E and Crude Glycerine
- Create an Asian market to reduce dependence on fossil fuel

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THANK YOU