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Palm Oil as Feedstock for Biodiesel: Production and Export from Malaysia

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Malaysian Oil Palm Industry (2009)

- **Malaysia and Indonesia: World's largest producers of palm oil (~85%)**
- **Malaysia: World's largest exporter of palm oil**
- **Production: 17.56 million tonnes**
- **Exports: 15.87 million tonnes**
- **Export value of oil palm products: RM49.59 billion (USD15 billion)**





Plantation



Fresh Fruit Bunch



Palm Tree

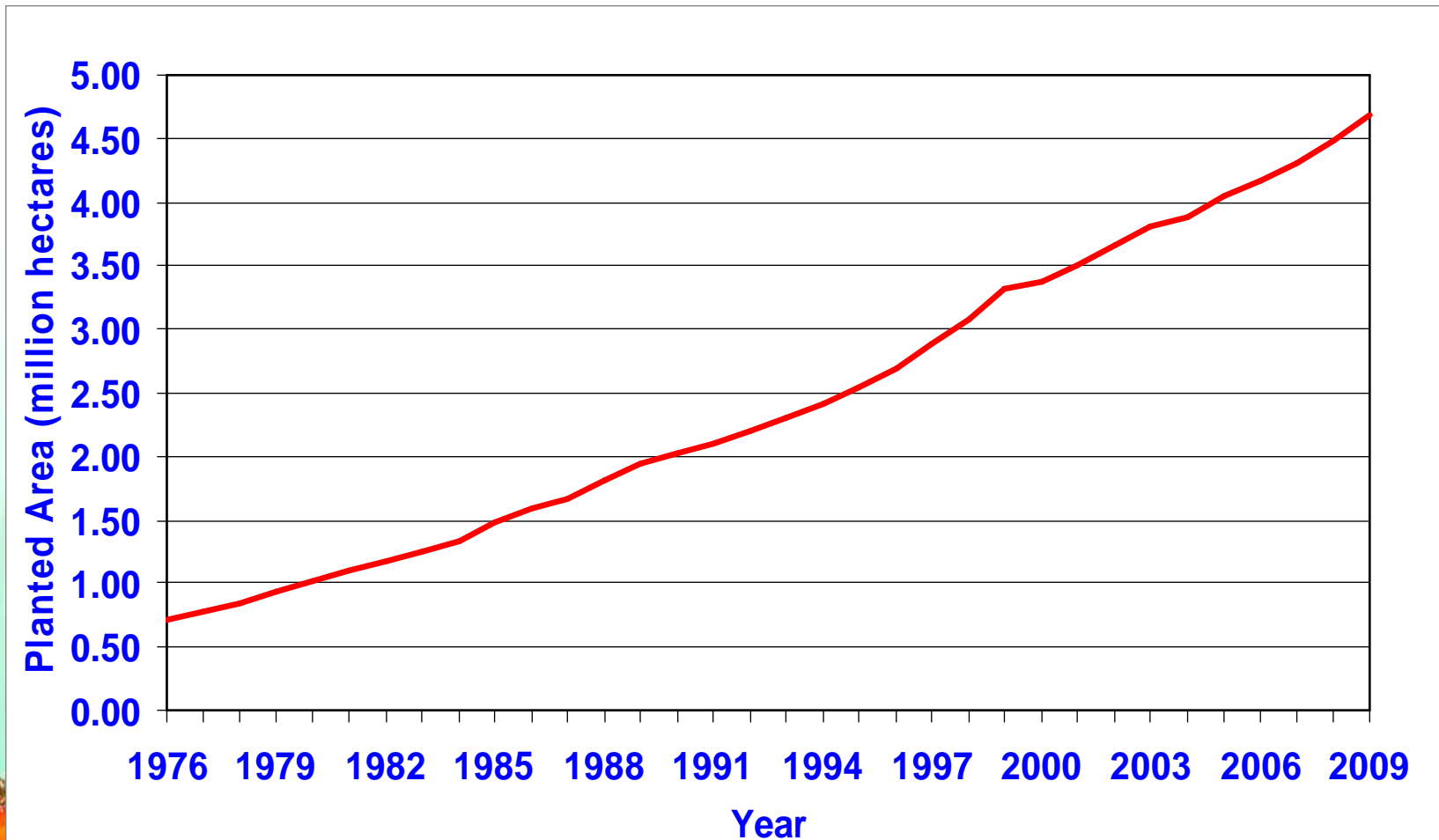






Malaysia: Oil Palm Planted Area

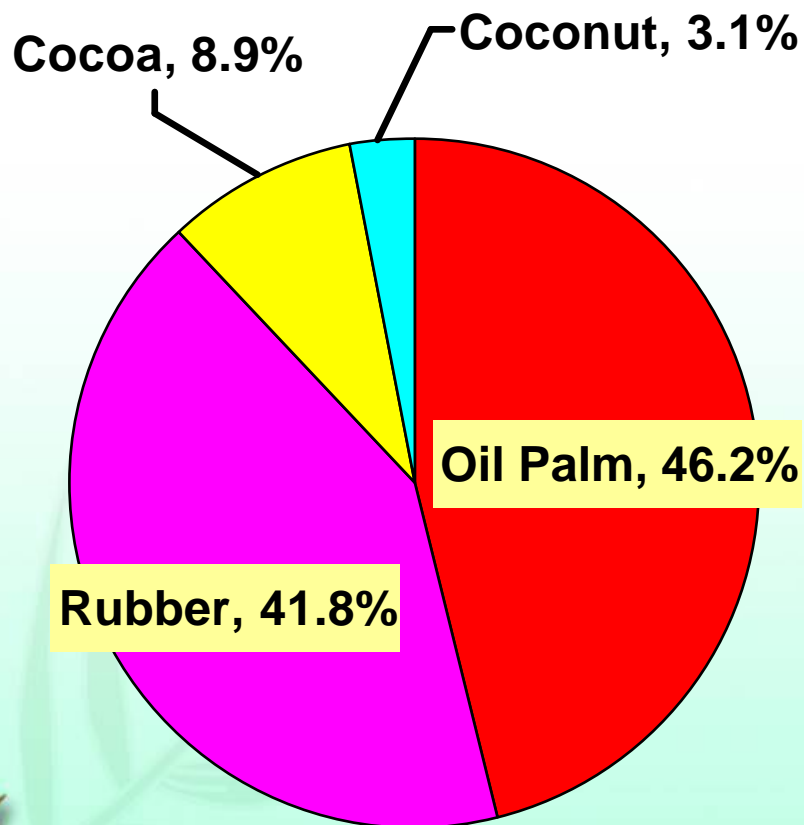
Total land area in Malaysia: 32.86 million hectares
Oil palm planted area: 4.69 million hectares (14%)



Changes in Land Use

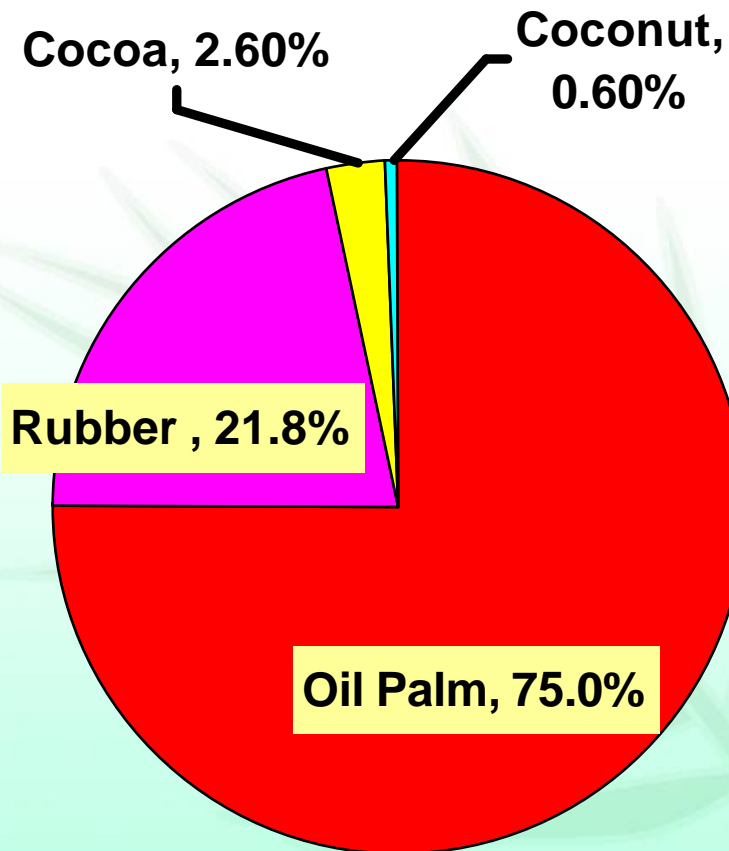
Year 1990

4.39 million hectares



Year 2006

5.56 million hectares



Common Raw Materials for Biodiesel Production and Their Oil Yield

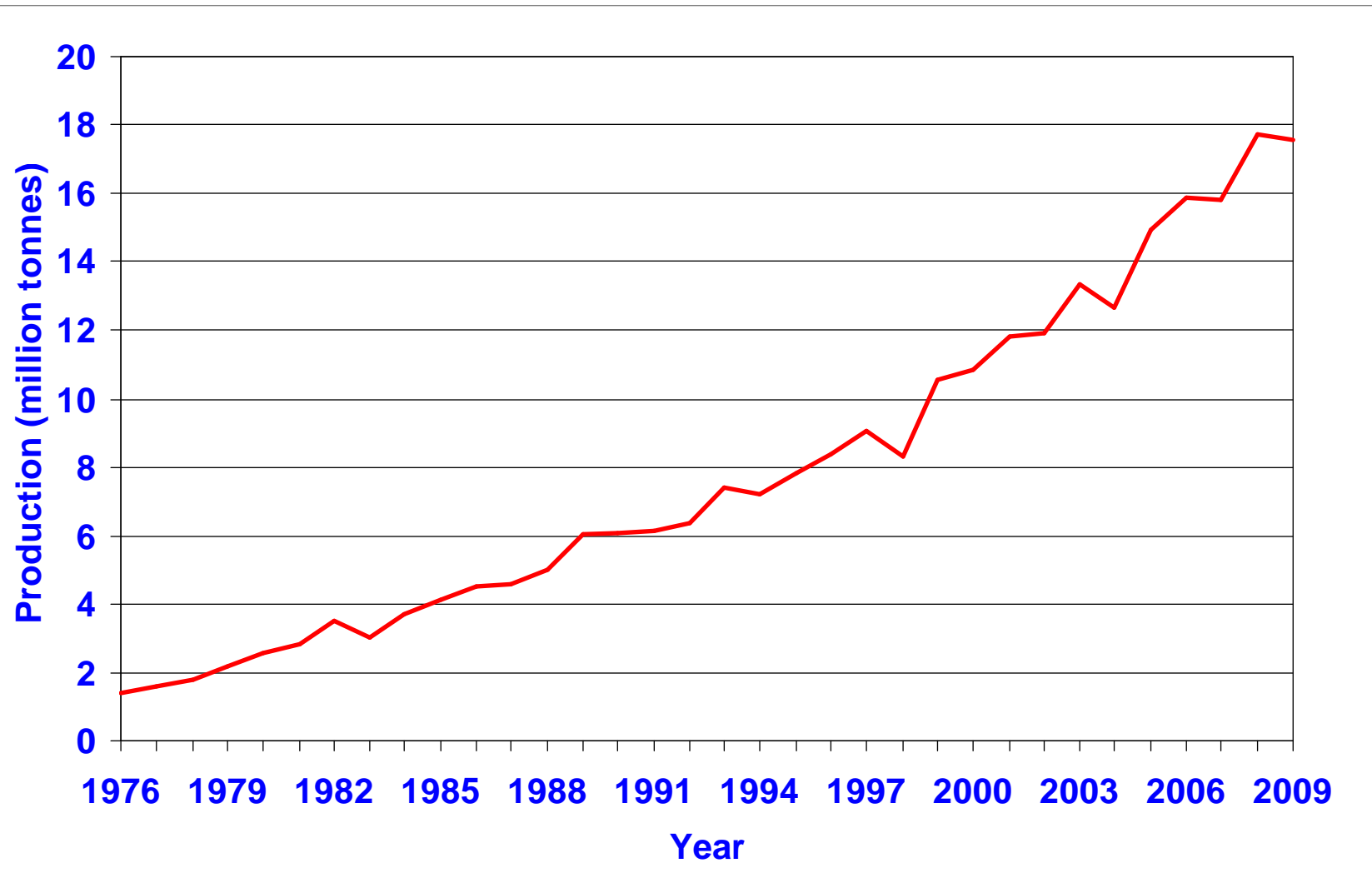
	Yield (tonne / ha / yr)
Palm Oil (Malaysia)	3.93*
Rapeseed (EU)	1.33**
Soybean (USA)	0.46**
Sunflower (Argentina)	0.66**
Jatropha	1.44***

**Highest Yield
& Most
Economical
Oil**

Source: * MPOB (2009) ** Khoo (2001) *** Steffan Preusser (2006)



Production of Palm Oil





Effective Plantation Management

- **Good agriculture practices**
 - Zero burning policy for replanting
 - Optimum use of chemicals
 - Planting of leguminous cover crops
- **Integrated pest management**
 - Use of natural predators
- **Utilisation of oil palm biomass**
 - Recycling of organic matters
 - Bio-fertilisers



Palm Oil Mill





Palm Kernel



Palm Mesocarp

Refined Palm Oil



Refined, bleached and deodorised palm olein





Improved Processing Technologies

- **Efficient technologies**
 - **Reduce chemicals, water and cost**
- **Waste management**
 - **Treatment of solid and liquid waste**
- **Utilisation of oil palm biomass/biogas**
 - **Generation of electricity**





Biodiesel Policy in Malaysia



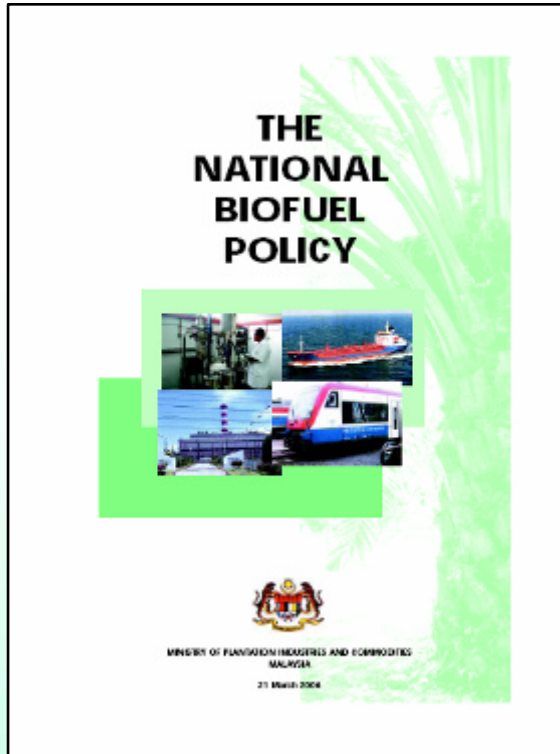


Biofuel Policy in Malaysia

- **Biodiesel is included in the list of products/activities that are encouraged under the Promotion of Investments Act 1986. Biodiesel projects are therefore eligible to be considered for Pioneer Status or Investment Tax Allowance**



National Biofuel Policy



Released 21 March 2006

- Thrust 1 : Use of Biofuel for Transport**
- Thrust 2 : Use of Biofuel for Industry**
- Thrust 3 : Development of Home Grown Biofuel Technologies**
- Thrust 4 : Production of Biofuel for Export**
- Thrust 5 : Biofuel for Cleaner Environment**

National Biofuel Policy

- **Use of environment-friendly, sustainable and viable alternative source of energy in order to reduce dependency on depleting fossil fuels; and**
- **Enhanced prosperity and well-being of all the stakeholders in the agriculture and commodity based industries, through stable and remunerative prices**



Malaysian Biofuel Industry Act 2007

- **Malaysian Biofuel Industry Act 2007 implemented since 1 November 2008.**
- **The Act provides for activities relating to the mandatory use of biofuel and licensing of activities relating to production, storage and trade.**





Development of Biodiesel Industry in Malaysia





Drivers for Biodiesel Development

- **Reduce GHG emission: Complementing global efforts and initiatives to mitigate climate change**
- **Energy security: Ensure adequate, secure, quality and cost effective supply of energy**
- **Sustainable development: Utilisation of renewable resources and protect the environment**
- **Higher income: Enhance and strengthen palm oil prices through value addition**



Development of Biodiesel Industry in Malaysia

- **Early 1980s**
- **Enhance and stabilise palm oil price**
- **Pilot plant (3,000 tpy) in operation in 1985 to produce palm biodiesel for exhaustive field trial (1985 – 1994)**



MPOB Palm Biodiesel Pilot Plant





Development of Biodiesel Industry in Malaysia

- Home-grown palm biodiesel production technologies, including winter grade biodiesel have been successfully commercialised
- Both summer and winter grades biodiesel are exported to EU, USA, Taiwan and others
- Palm biodiesel meets the international standards (EN 14214 and ASTM D6751)
- Patented biodiesel production technology now commercialised with plants in Malaysia, South Korea and Thailand



Palm Biodiesel



**Summer-Grade
Palm Biodiesel**

Pour point +15° C



**Winter-Grade
Palm Biodiesel**

Pour point -21° C



Biodiesel Plant, Malaysia



**Normal-grade Palm
Biodiesel Plant
60,000 TPA**



**Winter-grade Palm
Biodiesel Plant
30,000 TPA**



Enertech Biodiesel Plant, South Korea (2006/07)



Overview of Biodiesel Plant



Front view of Biodiesel Plant



New Biodiesel Co. Ltd., Thailand (2008/09)



Production of Palm Biodiesel

- 61 biodiesel production licenses issued with installed capacity of 6.8 million tonnes
- 18 biodiesel plants are in operation with annual production capacity of 1.86 million tonnes

	2006*	2007	2008	2009
Production (tonnes)	54,981	129,715	171,555	222,217

* August – December 2006

Exports of Palm Biodiesel

	2006*	2007	2008	2009
Export (tonnes)	47,986	95,013	182,108	227,457
Value (RM million)	120.9	253.2	610.7	605.8
Value ** (USD million)	36.6	76.7	185.0	183.6

* August – December 2006

** RM3.3 = USD1



Exports Market of Palm Biodiesel

Country	2008	2009
United States	71,324	39,594
European Union	70,273	119,277
Singapore*	29,485	38,821
South Korea	6,594	530
Taiwan	3,081	5,571
Australia	1,203	0
Indonesia*	0	23,006
Others	148	658
Total	182,108	227,457

* Re-exports



Implementation of B5 Programme

- **The B5 Programme is being implemented in Malaysia in phases beginning with Central Region from June 2011, taking into consideration time required for setting up of the inline blending facilities at petroleum depots.**
- **The implementation covers sectors that use petroleum diesel including transport and industrial sectors.**





Challenges to Biodiesel Industry Development





Challenges to Biodiesel Development

- **Sustainable development of biodiesel feedstock**
 - **Regulatory framework with more than 60 regulations to ensure compliance to environmental standards and sustainable practices**
- **Limited land availability**
 - **Enhancing productivity through research and development**



Challenges to Biodiesel Development

- **GHG emission**
 - **MPOB has completed the life cycle assessment (LCA) study for the production of palm biodiesel.**
 - **The study shows that palm biodiesel contributes to greater GHG emission saving as compared to petroleum diesel.**
 - **The study is currently under critical review and will be disseminated upon acceptance.**





Renewable Energy from Oil Palm Biomass



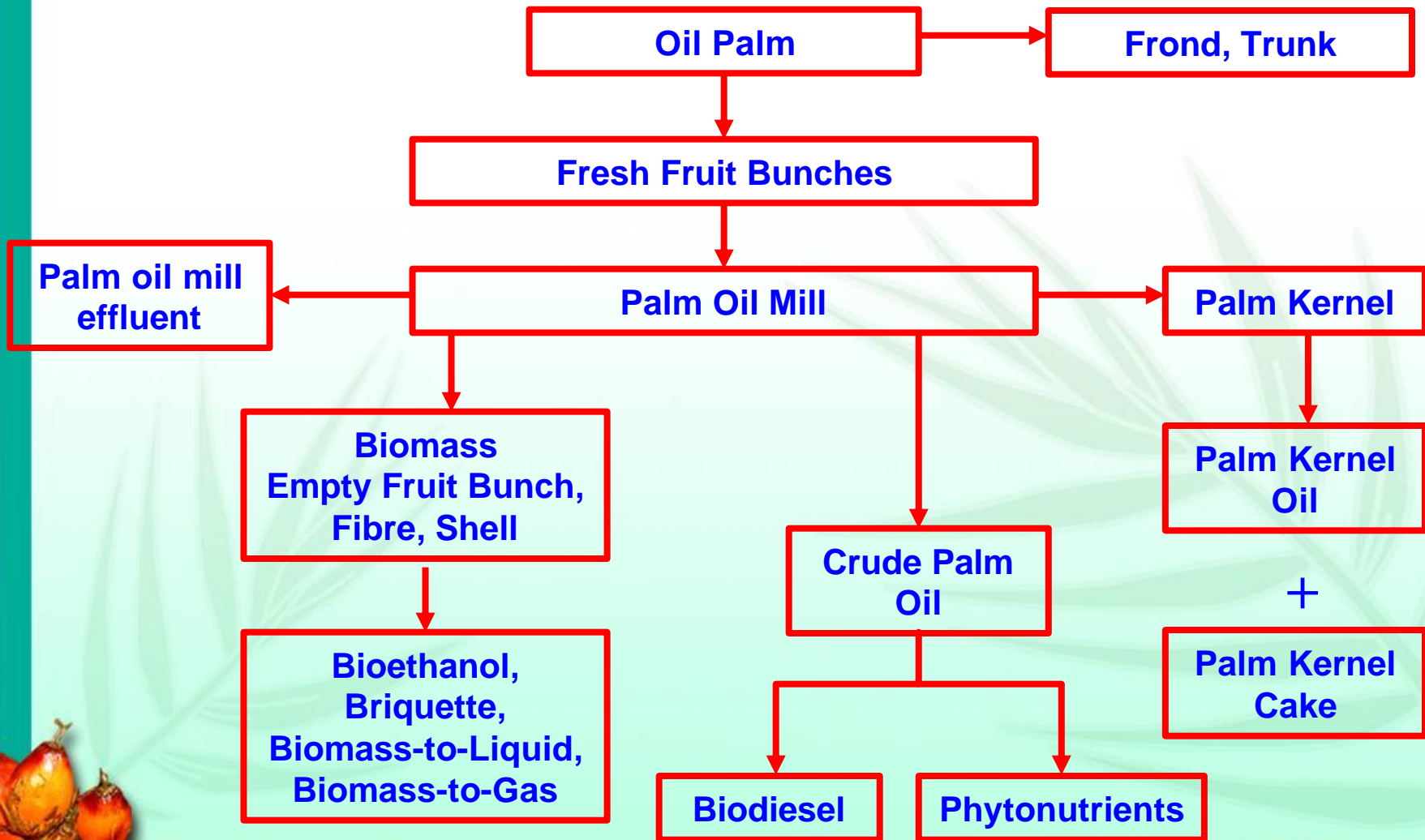


Palm-based Renewable Energy

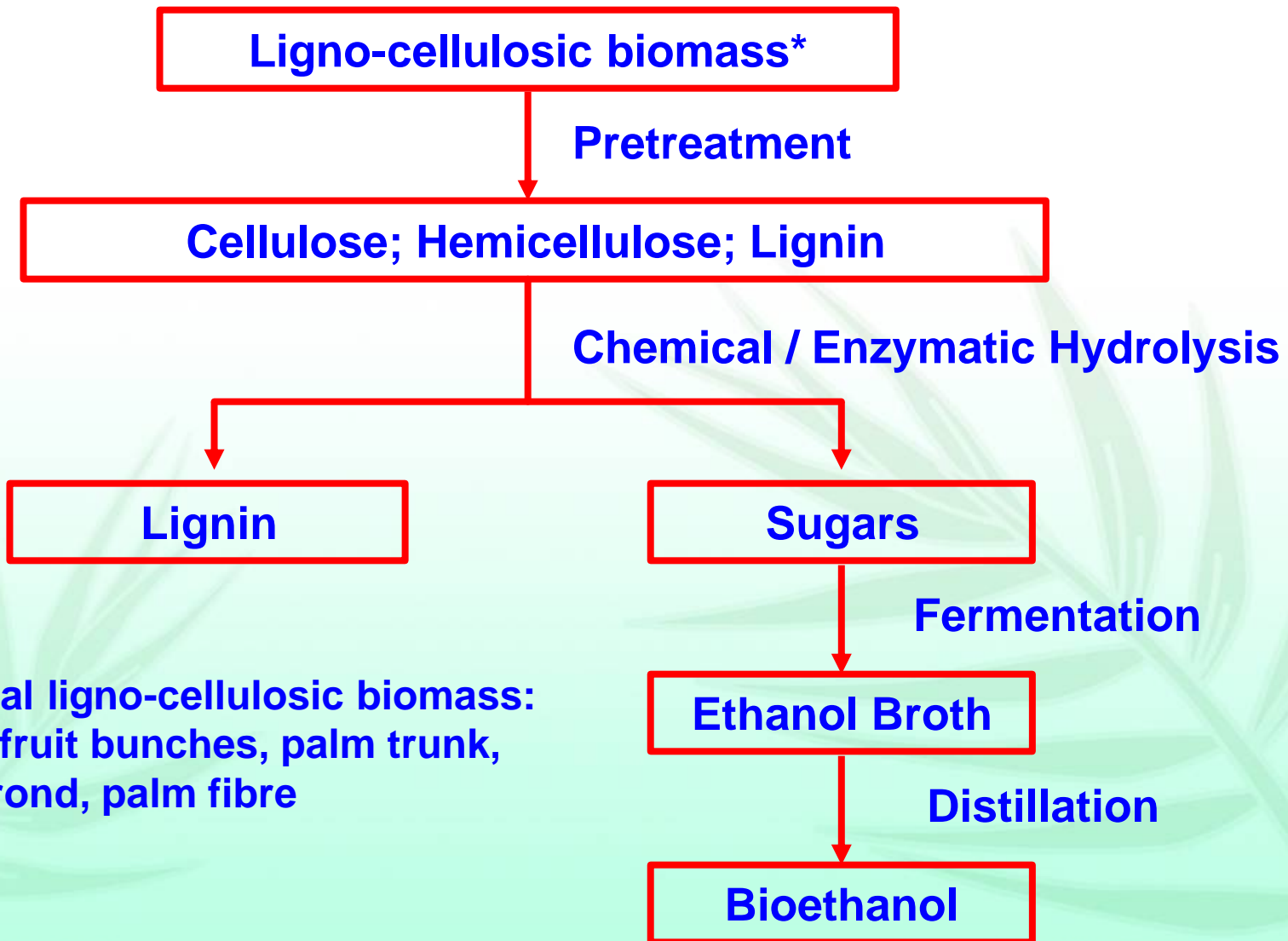
- **Liquid Fuel**
 - **Palm biodiesel**
 - **Bioethanol**
- **Solid Fuel**
 - **Biomass (e.g. fibre and shell)**
 - **Briquettes**
- **Gaseous Fuel**
 - **Biogas**



Potential Sources of Renewable Energy from Oil Palm



Conversion to Bioethanol



* Potential ligno-cellulosic biomass:
empty fruit bunches, palm trunk,
palm frond, palm fibre



Availability of Solid Oil Palm Biomass in 2009

Biomass	Quantity (million tonnes)
Empty fruit bunch	19.3
Palm Fibre	11.1
Palm Shell	5.1

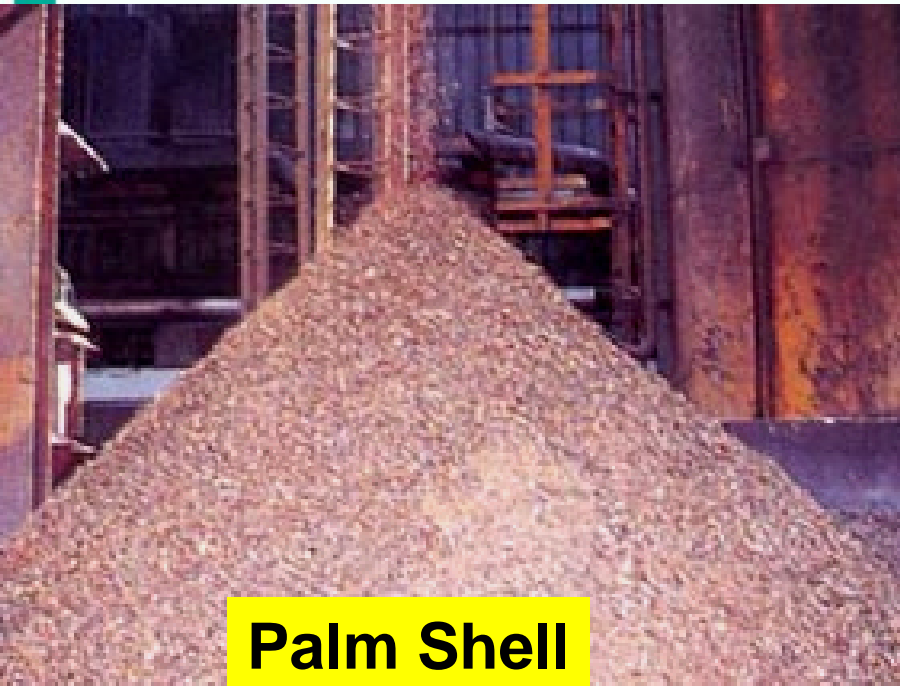




Utilisation of Solid Oil Palm Biomass



**Empty Fruit
Bunch**



Palm Shell



Palm Fibre

Palm Shell and Fibre

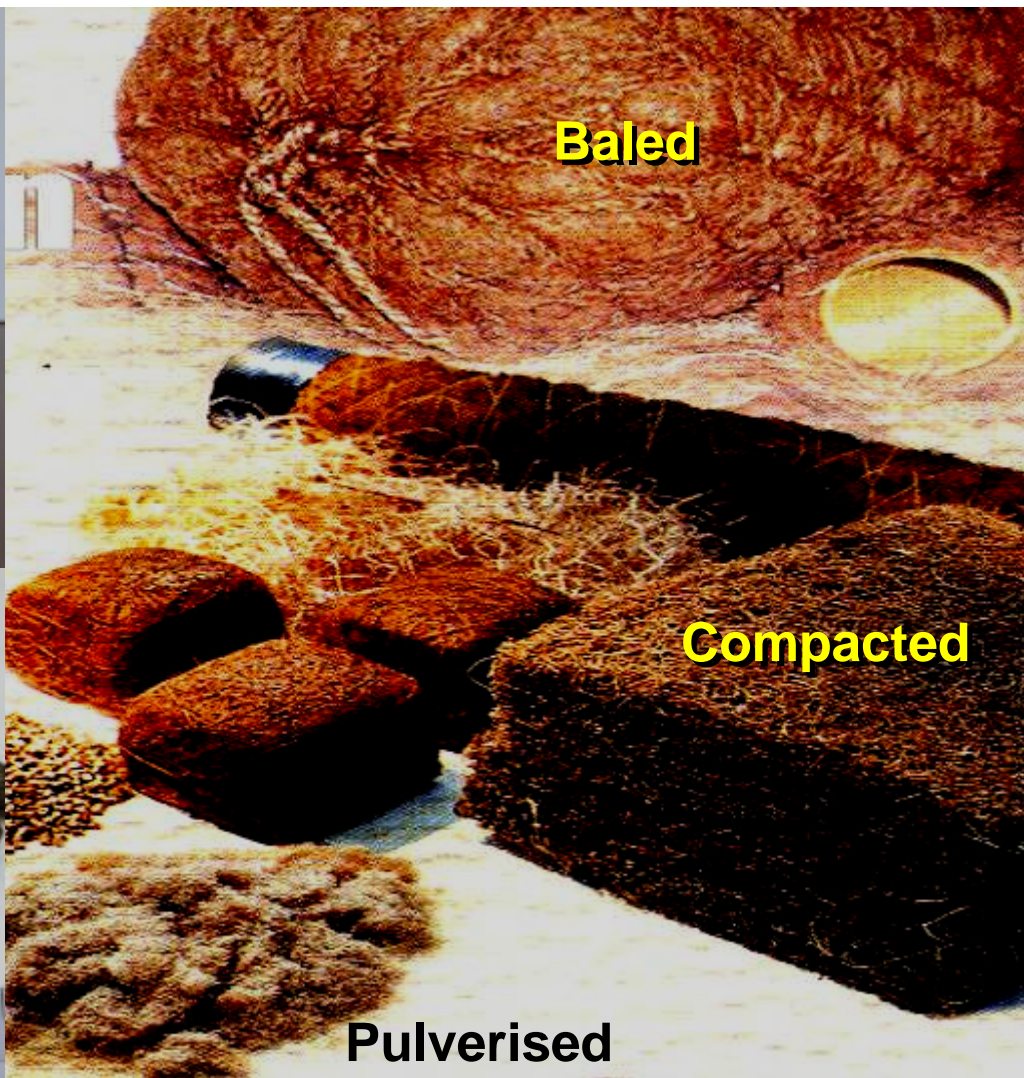
- Use as boiler fuels to produce steam for process and electricity to meet power requirement



Palm oil mills: Self sufficient in energy



Oil Palm Biomass as Solid Fuel



Palm Oil Mill Effluent as Gaseous Fuel



PONDS & TANK DIGESTER



UP POME TREATMENT SYSTEM



GAS ENGINE



Biogas from Palm Oil Mill Effluent

- **Biogas (65% CH₄, 35% CO₂) – gaseous product from anaerobic digestion**
- **About 28 m³ per tonne of palm oil mill effluent treated**
- **In 2008, an estimate of 15 billion m³ biogas generated**
- **Gross calorific value: 19,900 – 25,830 kJ/Nm³**





Benefits of Oil Palm Industry in Malaysia

- **Expand uses of palm oil**
- **Employment opportunities**
- **Extra income**
- **Social well being**
- **Development of infrastructure**
- **Value enhancement**
- **Value addition**



Conclusion

- **Malaysia emphasises the production of sustainable forms of renewable energy including palm biodiesel and next generation biofuels, taking into account the need to protect the environment**
- **Sustainable development of palm biodiesel in Malaysia contributes to**
 - **Energy security**
 - **Social development**
 - **Economic growth**





Thank you

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