

# Obstacles and Barriers to Bio-fuel Development and Considerations on Barrier Removal

Presented by  
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for  
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## Acknowledgement

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- Faizal Parish, *Peatlands: Reducing Emissions from Deforestation and Biofuel Production*, UNFCCC SBSTA Side Event on Peatlands in Bonn, 8 May 2007



## Summary

- Positive Developments
- Barrier 1 - Economics
- Barrier 2 - Competition for Food
- Barrier 3 - “Shades of Green”- Legislative issues
- Electric Car
- Conclusions



## Why Bio-Fuel?

- Rising Fuel Price in 2006-2008
- Public Awareness of harmful effects of CO<sub>2</sub> emission from use of fossil fuel
- Implementation of Public Policies towards mitigation of climate change (Green)
- CDM can positively impact the economics of Bio-Fuel (Financial Incentive)



**BPPT**

**Biofuel Development in Indonesia**

Mandatory of biofuel utilization according to  
Minister of Energy and Mineral Resources Regulation No. 32/2008

**Bioethanol (E100)**

Type of Sector	October 2008 until December 2008	January 2009	January 2010	January 2015**	January 2020**	January 2025**	Details
Household	-	-	-	-	-	-	
PSO Transportation	3% (existing)	1%	3%	5%	10%	15%	With respect to total demand
Non PSO Transportation	5% (existing)	5%	7%	10%	12%	15%	
Industrial and Commercial	-	5%	7%	10%	12%	15%	
Generating electricity	-	-	-	-	-	-	

2008/12/4

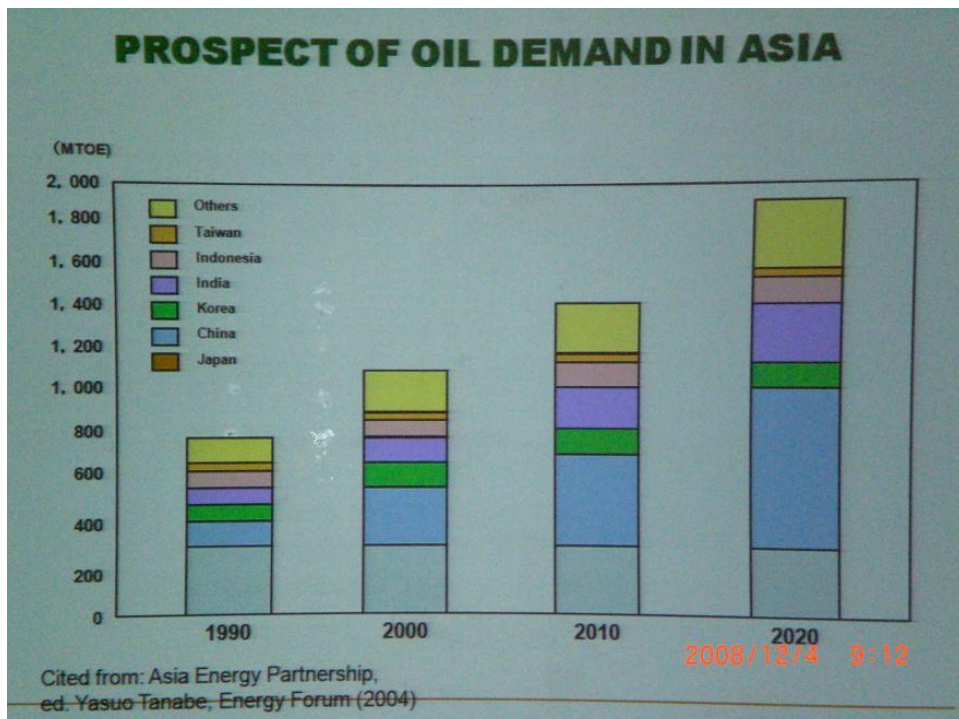
## Definition

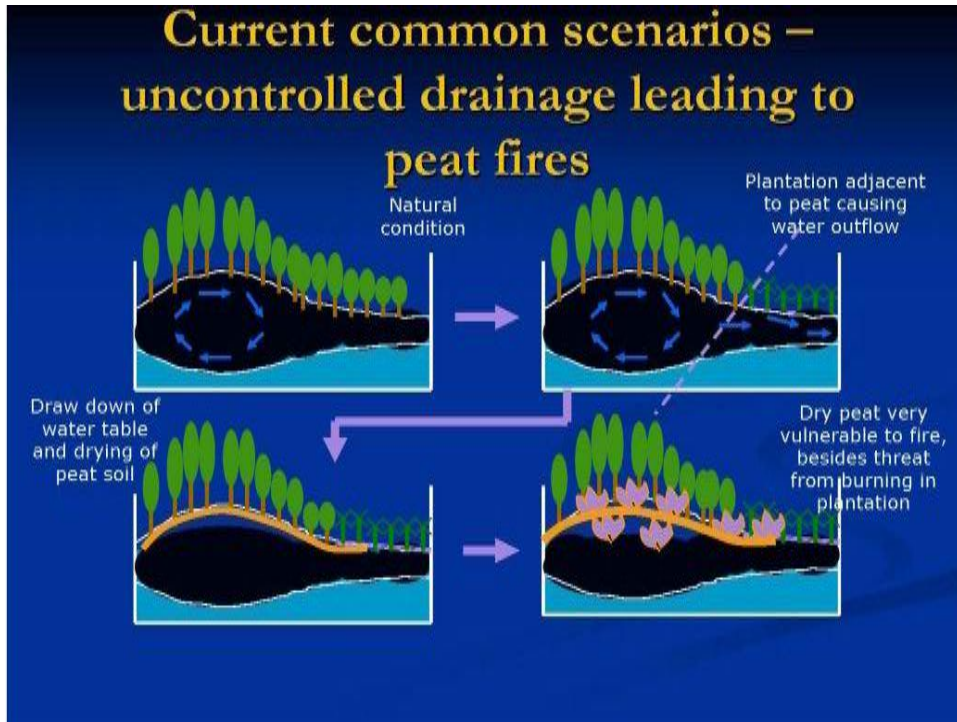
- **BIO-ETHANOL** - derived from fermentation of sugar
  - 1st generation - feed stock is "food"
  - 2nd generation - feed stock is "biomass waste" – chemically, physically or enzymatically, remove fibrous structure to release "sugar" then ferment
- **BIO-DIESEL** - derived from vegetable oil such as Palm Oil and Jatropha Oil; which are usually high in acid and different in carbon length



## Barrier – Economic Consideration

- Price of Fossil Fuel is cheap and available; the infrastructure of modern society is based on the use of Fossil Fuel
- The range of estimate for 100% conversion of available biomass for fuel use account for only 3 - 5% of total demand
- Increase of cultivation of dedicated energy crop may have negative effects on land use
- R&D cost for bringing experimental technology to full scale production
- CDM have not had it desired effects





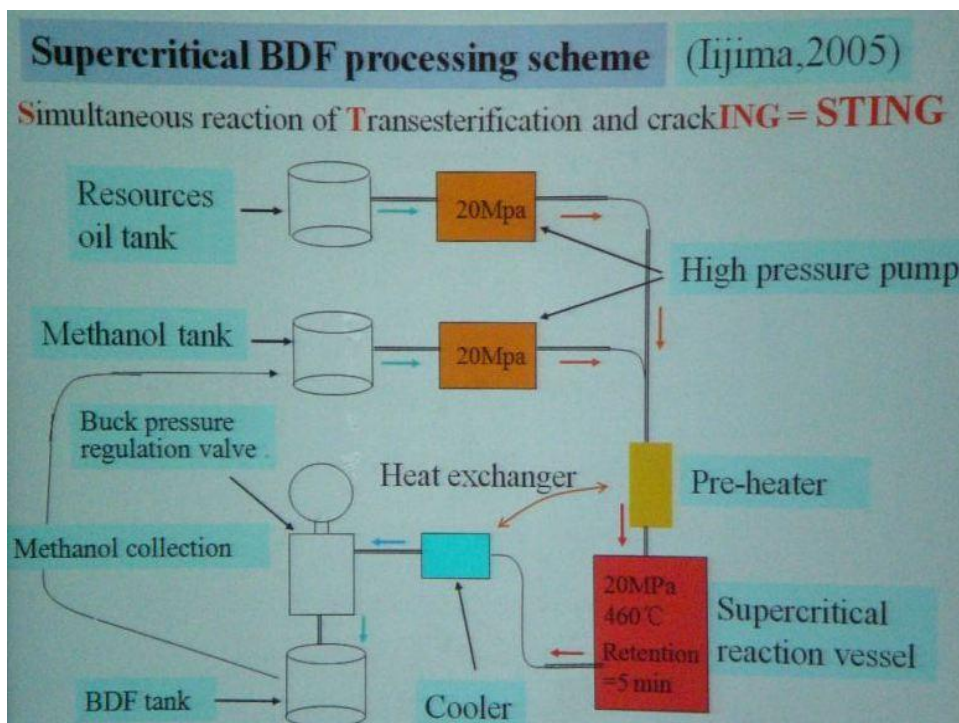
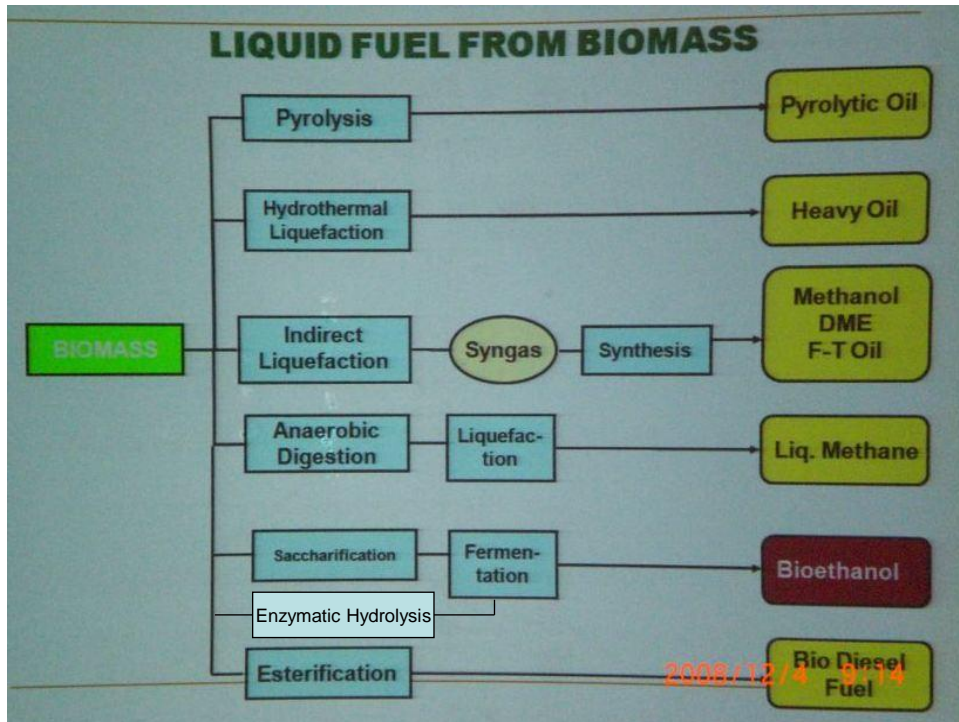
## Barrier – Competition for Food

- Mature, Commercial and Established technology such as
  - 1<sup>st</sup> generation Bio-ethanol production
  - Conversion of vegetable oil for Bio-diesel production

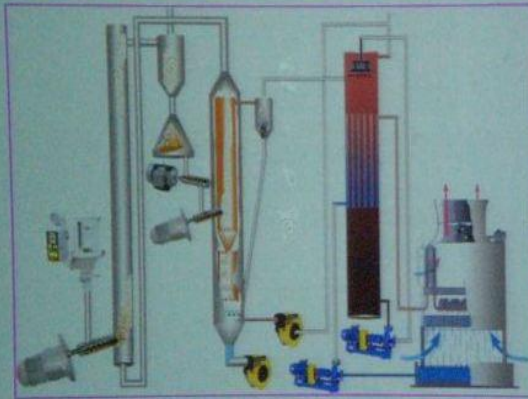
*use food as feed stock*

*Can Technology be used to substitute  
“biomass waste” for “food”?*

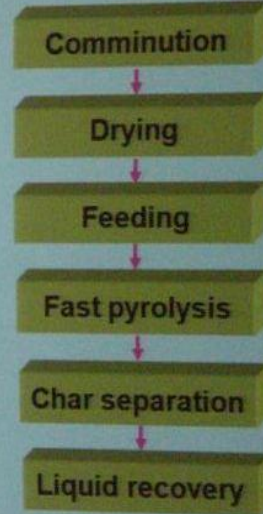




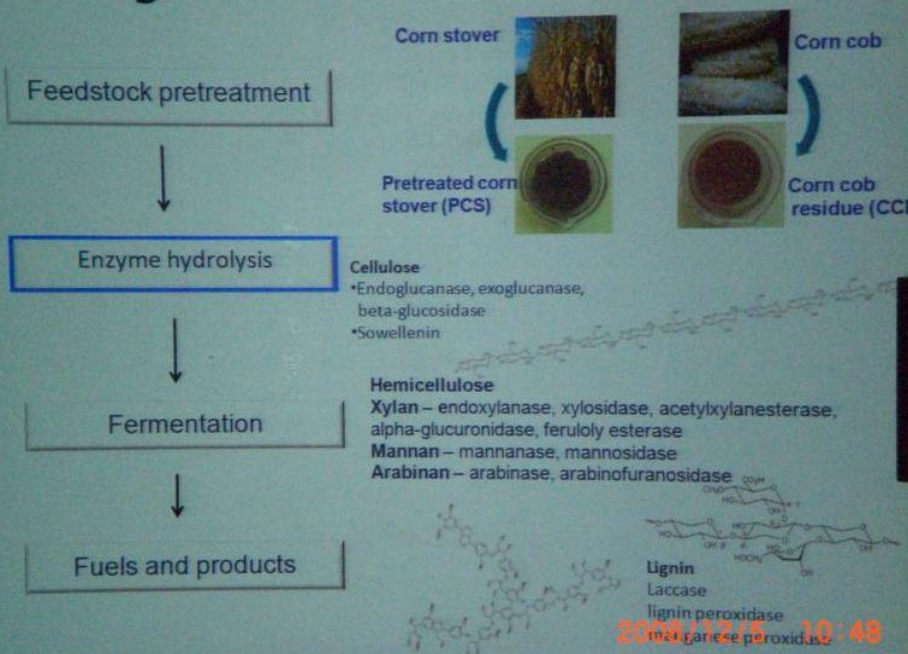
# Process of Biomass Fast Pyrolysis



Flowchart of biomass fast pyrolysis at USTC



# Lignocellulose bioconversion



## The Oil Yield of Some Oily Crops

	Seed Yield(t/ha)※		Oil content in the Seed(%)	Oil Yield(t/ha)
	Min-Max	Average		
Oil palm	12.6-32.4	19.2	20	3.84
Rapeseed	2.3-3.8	2.9	35	1.02
Sunflower	1.7-2.4	2.1	35	0.74
Peanuts	2.8-3.3	3.1	35	1.09
Soybean	2.3-3.6	2.8	17	0.48
Jatropha	1.5-2.0	—	—	0.48-0.71

※FAOSTAT ; 2005. These data are averages of 20 countries of top production in the world.

### Barrier – “what shade of green?”

- “The most commonly used Life Cycle Analysis indicated that bio-fuels have substantially lower net emissions than conventional petroleum-based fuel”

*However, this is full of controversies..*



## Balancing Biofuel saving and peatland emission

- One hectare of oil palm may generate a maximum of 4 tonnes of crude palm oil per annum
- Following processing and transport 4 tonnes of palm oil can substitute a maximum of 3.4 tonnes of diesel and will theoretically reduce net carbon dioxide emissions from fossil fuel of about 8-10 tonnes
- **HOWEVER** if we add the emission from the plantation on peat (70 tonnes per ha) the net effect is an **INCREASE** of 60 tonnes of CO<sub>2</sub>/ ha or 15 tonnes CO<sub>2</sub> / tonne of palm oil.
- **THEREFORE** for every ha of palm oil biofuel plantation we create on peatland we increase CO<sub>2</sub> emissions and make climate change **MUCH WORSE**.

### Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources

#### Article 15 Environmental Sustainability Criteria for Biofuels and other Bioliquids

- Green house gas emissions saving from use of biofuels and other bioliquids shall be at least 35%.
- Raw materials shall not be obtained from land with recognised high biodiversity value:
  - Forest disturbed by significant human activity
  - Area designated for nature protection purposes, unless evidence is provided that there is no interference with the purposes.
  - Highly biodiverse grassland, i.e. grassland that is species-rich, not fertilised, not degraded.

## GBEP

- Task force on Green House Gas Methodologies for Transport Biofuels - Canada, France, Germany, Italy, Japan, UK, USA, UNEP, UN Foundation, International Council on Clean Transportation, U. California Berkeley, Iowa State U.
- Proposal to harmonise the methodologies for measuring GHG benefits of transport biofuels.

Main reasons for pursuing increased use of biofuels worldwide is their potential to:

- reduce GHG emissions from the transport sector
- contribute to climate change mitigation and
- increased energy security.

## GBEP

- Preliminary list of parameters for the checklist:
  - The GHGs to be covered
  - The effects of direct land use change, both in terms of above and below ground carbon inventories
  - The effects of the production cycle, including fertiliser production, agricultural inputs and processing energy
  - Combustion of the finished biofuel and tailpipe emissions
  - Corresponding factors to facilitate comparison with the petroleum fuel replaced.

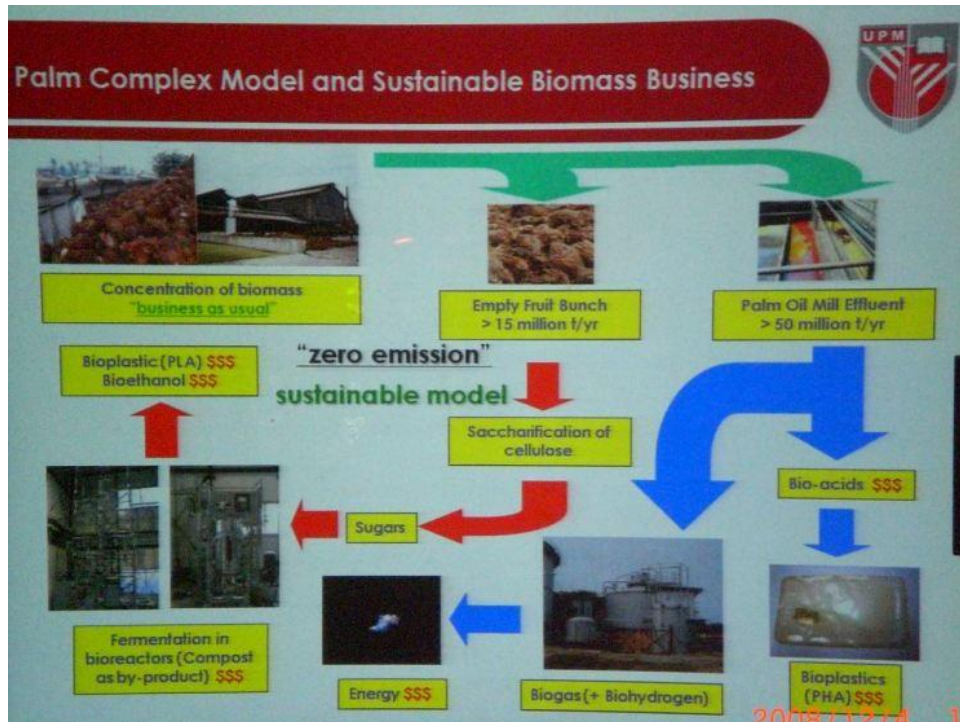
## Electric Cars

- Electric cars, re-chargeable at home could **Revolutionalize** transport fuel demand
- Mature and Established technology are available to send electricity down National Grid System
- Renewable energy sources not limited to biomass are available
- Clean Coal Technology can improve efficiency by 50% for coal power stations



Energy source	Technology	Cost, \$/MWh <sup>(a)</sup>	Expected trend
Coal	Coal fired steam	30-40	Stable
Gas		35-60	Small decrease
Wind	Wind turbine/generator	75-90	Decrease 15-30 by 2010
	Wind RAPS	150-400	
Hydro	Hydro turbine/generator	40-100	Increase (attractive site are used) Remain constant
	Micro hydro RAPS	70-250	
Fuel wood	Boiler	70-110	
	Pyrolysis furnace	0.45-0.85 per litre	
Bagasse	Boiler (cogeneration)	50-60	Decrease expected with efficient increase
	Gasification	30-100 <sup>(b)</sup>	
Various wastes	Boiler (cogeneration)	80-200 <sup>(b)</sup>	Decrease 25% by 2010
	Gasifier/gas engine		
Sugar, starch, cellulose	Hydrolysis/fermentation/distillation	0.28-0.69 / lit ethanol	Competitive with oil by 2010
Wet waste	Biogas digestion/ Gas engine	30-200	Increase beyond 2005
Landfill gas Sewage gas	Gas engine	50-89	No change to 2010

- a. Unit is Australian \$/MWh except where other unit is specific  
 b. Estimated cost once technically viable



## Conclusion

- Direct competition for food and implications for land use need to be resolved
- Cost of production of 2<sup>nd</sup> generation bio-fuels need to come down – means more R&D
- Is there enough political will for a fundamental shifts to electrification of fuel for transport?

# Thank You

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