



## Research Background

- **Potential energy problem**
  - **Population: 220 million**
  - **Highly dependent on non-renewable energy**
  - **Deficit is increasing**
  - **Price highly fluctuated**
  - **Wide impacts of energy crisis (economic, social, and even political)**

## Supporting Facts

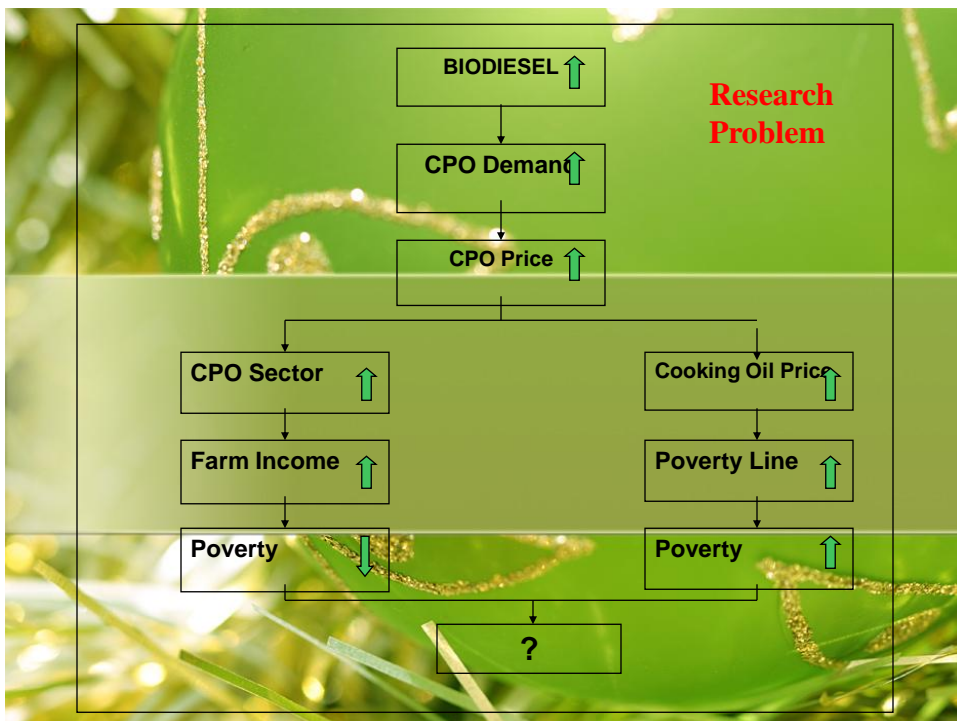
- **Production declining**
  - 1977 : 1.685 thousand barell/day
  - 2006 : 909 thousand barell/day
  - - 1.83 per cent annual growth rate
- **Consumption increasing**
  - 1977 : 300 thousand barell/day
  - 2006 : 1.230 thousand barell/day
  - 5.04% per cent annual growth rate
  - Net importer since year 2000

## Diesel Fuel

- **Consumption**
  - 5 percent annual growth rate
  - 28.6 million kiloliter in 2006
- **Domestic Production**
  - 75% of the total consumption
  - 21.45 million kiloliter in 2006

## CPO Based Biodiesel as a strategic option

- ✓ 10 percent use will reduce fuel subsidy by around US\$ 0.24 B per annum
- ✓ Renewable
- ✓ The biggest CPO producing countries
- ✓ Domestic price stabilization of CPO



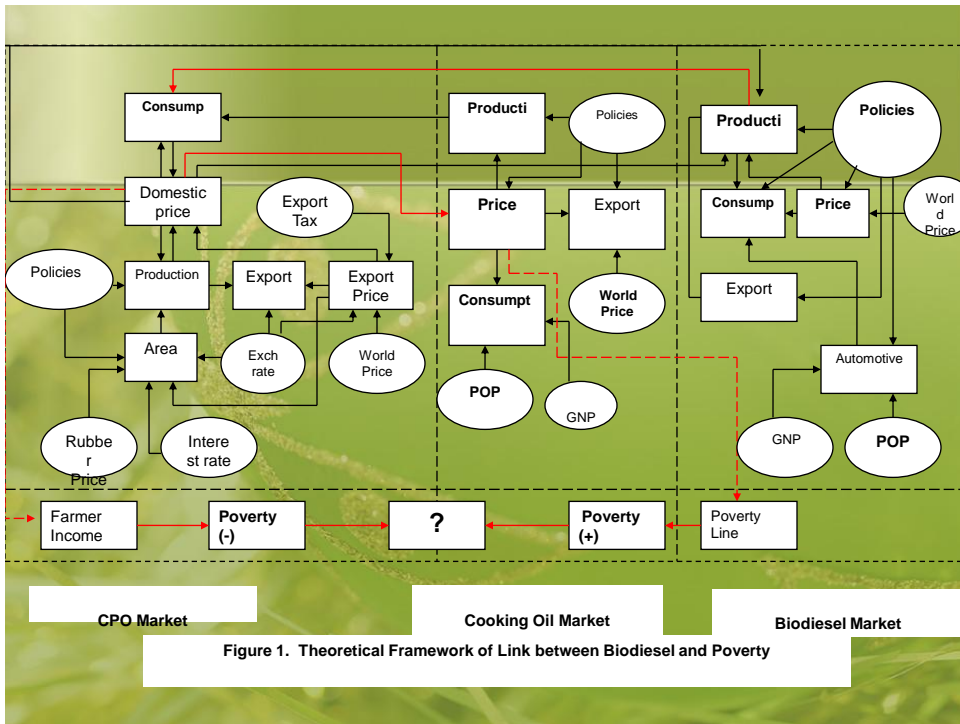
## Research Objectives

- To assess the impacts of the development of CPO based Biodiesel on CPO industry (price. area. production).
- To assess the impacts of the development of CPO based Biodiesel on poverty in Indonesia

## Research Method

**Four Sub-Models**  
**CPO Submodel**  
**Cooking Oil Submodel**  
**Biodiesel Submodel**  
**Poverty Submodel**

**Preliminary model!**



## 25 Equations CPO Sub-Model (example)

- $POAt = f(RPORBP, INE, INI, D0) \dots\dots\dots(1)$
- $POQt = f(POP, POA, T) \dots\dots\dots(2)$
- $POCt = POCCO + POCBD + POCOU \dots\dots\dots(3)$
- $POXt = f((1-INTAXt)WDPOPt*INEt) . INPOQt) \dots\dots\dots(4)$
- $POST = f((WDPOPt-WDPOPt-1). INPOQt . INPOCt) \dots\dots\dots(5)$
- $POMt = POCt + POXt + POST - POQt - POST-1 \dots\dots\dots(6)$
- $POPt = f((1-INTAXt)WDPOPt*INEt) . POQt) \dots\dots\dots(7)$
- $POCOU = f(INN, INF) \dots\dots\dots(8)$

## Preliminary Findings

- ✓ CPO Market
- ✓ Biodiesel
- ✓ Poverty
- ✓ Biodiesel and Poverty

## Indonesia CPO Market

Description	2008	Growth (2003/08) (% p.a)
Production (M ton)	18.8	12.5
Domestic Use (M ton)	4.5	7.4
Export (M ton)	14.5	17.0

# Biodiesel Industry

## Indonesia

Number of company : 6

Capacity : 1.9 M ton/year

Production : ?

## Malaysia

Number of active company : 15

Number of licensed company : 91

Export (2008) : 200 Thousand ton

# Poverty Line

Poverty line (2007) : Rp 166.697 per capita per month = US\$ 18/month

Basic need approach

Food : 2100 kkal

Share of rice in poverty line : 26-35 %

Share of cooking oil in poverty line:1.12%

## Poverty in Indonesia

Year	Number of the Poor (million)			Number of the Poor (%)		
	Urban	Rural	Total	Urban	Rural	Total
1996	9.42	24.59	34.01	13.39	19.78	17.47
1998	17.60	31.90	49.50	21.92	25.72	24.23
1999	15.64	32.33	47.97	19.41	26.03	23.42
2000	12.30	26.40	38.70	14.60	22.38	19.14
2001	8.60	29.30	37.90	9.76	24.84	18.41
2002	13.30	25.10	38.40	14.46	21.10	18.20
003	12.20	25.10	37.30	13.57	20.23	17.42
2004	11.40	24.80	36.10	12.13	20.11	16.66
2005	12.40	22.70	35.10	11.37	19.51	15.97
2006	14.29	24.76	39.05	13.36	21.29	17.75
2007	13.56	23.61	37.17	12.52	20.37	16.58

## 25 Equations Estimated Cooking Oil Sub-Model Factors affecting cooking oil production

Variable	Coefficient Estimate	t-statistic	Elasticity
Constant	-21.09	0.94	
Cooking oil price	0.12	0.05	0.15
CPO price	-0.16	0.001	-0.14
Government trade policy	91.96	0.33	0.03
Last year production	1.09	0.0001	1.06
F-statistic F	401.70		
R <sup>2</sup>	0.98		
Durbin Watson	1.87		

### Simulation 1. Biodiesel Production 1.3 M ton

Description	Basic	With Policy	Impact	
			Value	%
<b>Palm Oil</b>				
Domestic CPO Price (Rp/kg)	8000	8386	386	4.82
Palm oil area (M ha)	5.28	5.33	0.05	0.96
CPO production (M ton)	16.70	16.94	0.24	1.45
Domestic uses (M ton)	5.71	6.62	0.92	16.07
<b>Cooking Oil</b>				
Cooking oil price (Rp/kg)	8000	8308	308	3.86
Production (M ton)	3.24	3.14	-0.09	-2.89
Consumption (M ton)	4.12	4.06	-0.06	-1.54
<b>Poverty Impact</b>				
Oil Palm Area (thousand people)			-23	-0.059
Non-Oil Palm Area (thousand people)			2	0.004
National (thousand people)	37950	37929	-21	-0.055

### Simulation 2. Biodiesel Production 2.6 M ton

Description	Basic	With Policy	Impact	
			Value	%
<b>Palm Oil</b>				
Domestic CPO Price (Rp/kg)	8000	8741	741	9.26
Palm oil area (M ha)	5.28	5.38	0.10	1.85
CPO production (M ton)	16.70	17.16	0.46	2.78
Domestic uses (M ton)	5.97	7.81	1.84	30.88
<b>Cooking Oil</b>				
Cooking oil price (Rp/kg)	8000	8593	593	7.41
Production (M ton)	3.24	3.05	-0.18	-5.58
Consumption (M ton)	4.12	4.00	-0.12	-2.96
<b>Poverty Impact</b>				
Oil Palm Area (thousand people)			-43	-0.11
Non-Oil Palm Area (thousand people)			3	0.01
National (thousand people)	37950	37910	-40	-0.11

### Simulation 3. Biodiesel Production 1.3 M ton and CPO price Increasing by 10%

Description	Basic	With Policy	Impact	
			Value	%
<b>Palm Oil</b>				
Domestic CPO Price (Rp/kg)	8000	9021	1021	12.76
Palm oil area (M ha)	5.28	5.41	0.13	2.55
CPO production (M ton)	16.70	17.34	0.64	3.83
Domestic uses (M ton)	5.71	6.42	0.72	12.54
<b>Cooking Oil</b>				
Cooking oil price (Rp/kg)	8000	8817	817	10.21
Production (M ton)	3.24	2.99	-0.25	-7.62
Consumption (M ton)	4.12	3.95	-0.17	-4.08
<b>Poverty Impact</b>				
Oil Palm Area (thousand people)			-60	-0.16
Non-Oil Palm Area (thousand people)			4	0.01
National (thousand people)	37950	37895	-55	-0.15

## Conclusions

- ✓ **The impacts of the development of CPO based biodiesel:**
  - ✓ Positive on CPO industry
  - ✓ Negative on cooking oil industry
  - ✓ Reducing poverty (marginally)
- ✓ **No trade off between biodiesel (energy) and poverty**

## Policy Implications

- Speeding up the development of biodiesel. given the positive impacts and relatively low CPO price
- Government supports
  - Assigning government owned company as pioneers
  - Tax subsidy
  - Price support
  - Cooking oil price subsidy to the poor
- Need more comprehensive research (model), field survey. and updated coefficients

