

# RELATIVE IMPORTANCE OF PRODUCTIVITY, LAND EXPANSION, DEMAND FOR PALM OIL AND GLOBAL PRICE CHANGES ON THE DIRECTIONS OF BIO FUEL AND INDONESIA ECONOMIC PERFORMANCE

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# Outline

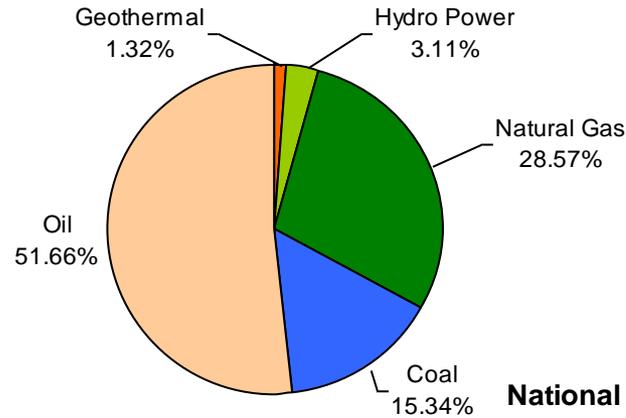
- Introduction
- Model
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- Bio fuel and Indonesian Economy
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# Introduction

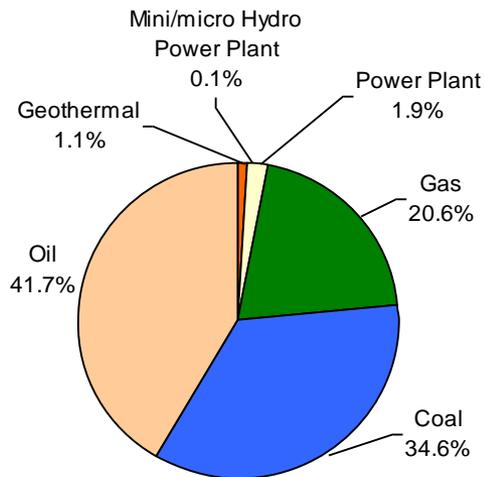
- Ministry of Energy (2008):
  - Indonesia's share of non-renewable energy source is more than 95%, consisting of Oil (51.7%), Natural Gas (28.6%), and Coal (15.3%).
  - Whereas the share of renewable energy source is less than 5%: Hydropower (3.1%) and Geothermal (1.3%).
- Indonesia: Production ↓ . Consumption ↑ ⇒ Imports Oil
- World oil price ↑ ⇒ Indonesia's subsidy for oil ↑

# NATIONAL ENERGY POLICY (PRESIDENTIAL DECREE NO. 5 YEAR 2006)

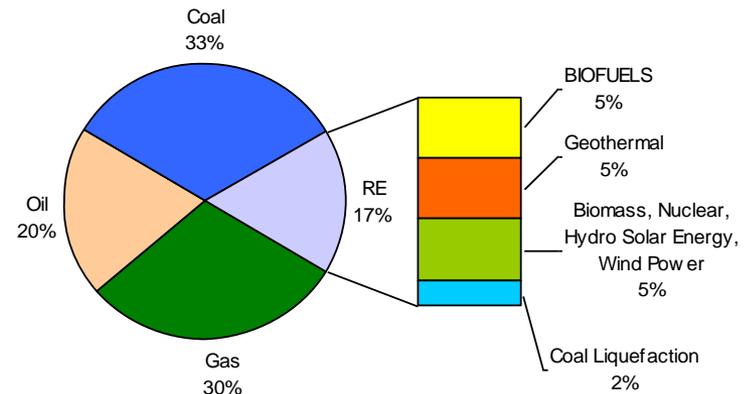
**CURRENT ENERGY MIX (1 million BOE)  
National (Primary) Energy Mix**



**National (primary) Energy Mix of 2025  
(BaU Scenario) (5 million BOE)**



**National Energy Mix 2025 (3 million BOE)  
(Presidential Decree No. 5/ 2006)**



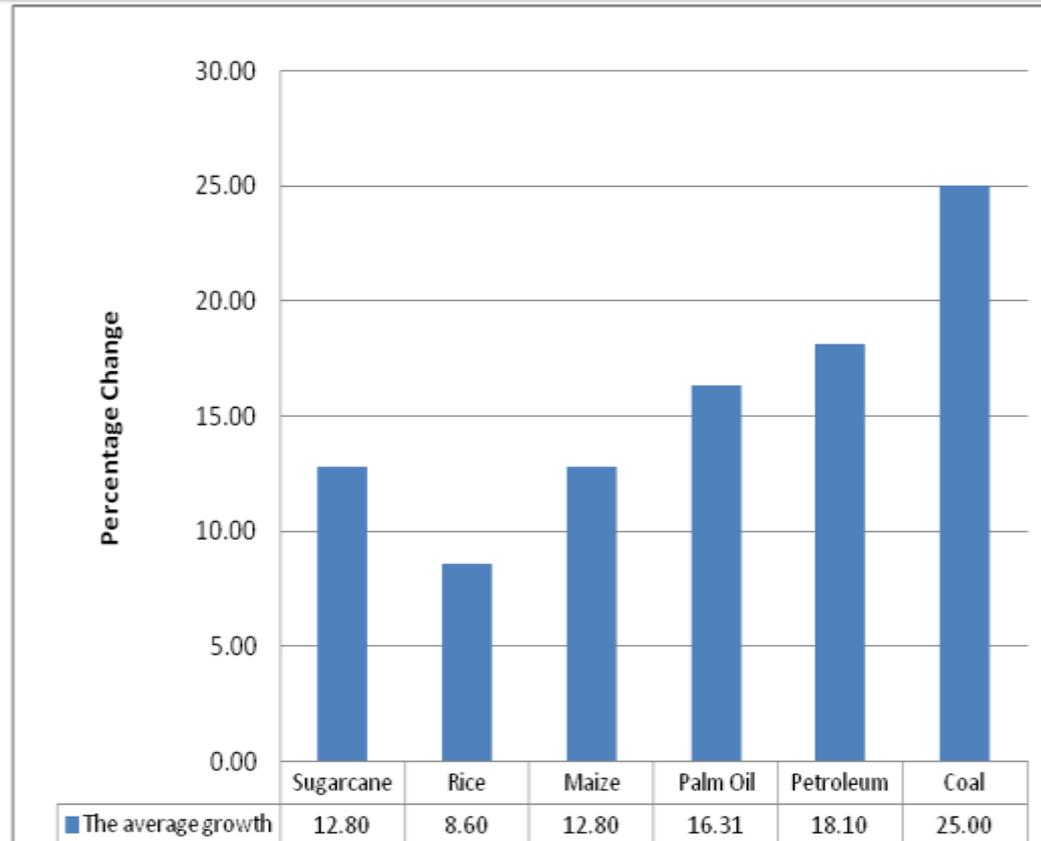
- Thus, renewable energy is needed: **Bio fuel.**
- Indonesia has the production potentials, primarily from palm oil and soybean for biodiesel; and maize, sugarcane, and cassava for bio ethanol. ➡ Demand for these crops and land do increase. This may lead to a competition between bio fuel development and food security.
- Hence, this research attempts to analyse impacts of policy options (productivity, land extention and intermediate demand increases) and the global food and mining price changes on bio fuel and the Indonesian economy performance.

# The Model

- Recursive Dynamic Computable General Equilibrium for Indonesia following ORANI-F (Horridge *et al.* (1993), INDOF (Oktaviani, 2000), WAYANG (Wittwer, 1999) and ORANIGRD (Horridge, 2002))
- Summary of the database structure of the model:
  - Industries and Commodities: 68 goods and services produced by 68 corresponding industries (New disaggregation on **Bio fuel and Cassava**)
  - Regional: JavaBali, Sumatera, Others
  - Factors of Production:
    1. Labor: Farmer, operator, administrator, manager.
    2. Capital
    3. Households: 7 rural and 3 urban

# The Model Simulations

- **First**, escalating prices of agricultural (Sugarcane, Rice, Maize and Palm Oil) and mining (Petroleum and Coal), which is considered as various external shocks to Indonesian economy.



**Figure 3. Average Growth Per Year during 2000-2011 of The International Agricultural and Mining Product Prices**

# The Model Simulations (2)

- **Second** simulation: increasing demand for CPO as the main intermediate inputs for bio fuel with 15 per cent shock to baseline (Indonesian Biofuel Mandate by 2015)
- **Third** simulation: Total Productivity (TFP), which is computed from Bank Indonesia (2011).
  - rice 13.14 percent
  - maize 13.14 per cent
  - cassava 13.14 percent
  - sugarcane 16.07 percent
  - palm oil 16.07 percent

# The Model Simulations (3)

- **Fourth** simulation Biofuel mandate by increasing the demand for land.
  - Paddy (34 percent/ year)
  - maize (1,86 percent/ year),
  - CPO (10.82 percent/ year),
  - sugarcane (1.69 percent/year ),
  - cassava (0.95 percent/year)
- **The fifth** simulation is a combined simulation (3 and 4)
  - increase in productivity of food crops (rice, maize, soybean and cassava) and an increase in demand for land of sugar cane and palm oil.

# Impacts on Indonesian Macroeconomy (1)

Macroeconomic Variables	Percentage Change (%)					
	Baseline	Sim 1	Sim 2	Sim 3	Sim 4	Sim 5
Average capital rental	24.21	24.80	25.72	25.55	24.24	25.20
Real devaluation	3.03	3.30	2.43	3.77	3.02	3.87
Terms of trade	-1.69	-0.49	-1.65	-1.63	-1.69	-1.65
Consumer price index	12.69	12.11	11.82	11.20	12.67	11.44
Exports price index	14.63	16.11	14.08	15.44	14.63	15.52
Average real wage	17.88	17.30	20.36	21.07	17.93	20.47
Aggregate revenue from all indirect taxes	23.05	20.88	22.67	23.41	23.05	23.58
Import volume index, C.I.F. weights	8.94	9.28	8.78	8.62	8.94	8.70
Real GDP from expenditure side	12.28	12.16	13.34	13.09	12.29	12.87
Aggregate real investment expenditure	14.20	14.60	15.36	15.17	14.21	14.92
Real household consumption	8.40	8.80	9.56	9.37	8.41	9.12
Export volume index	10.70	9.78	10.67	10.36	10.70	10.42

# Impacts on Indonesian Macroeconomy (2)

- Global changes in Agric-Mining Prices:
  - Negative impacts (as compared to the baseline impact) on some macroeconomic variables (GDP, real wage and devaluation).
  - These are due to relatively low competitiveness of a number of Indonesian products (low value added)
- Increasing demand for Palm Oil:
  - Increases in Indonesian macroeconomic performance (GDP, real consumption, investment, real wage)

# Impacts on Indonesian Macroeconomy (3)

- The accumulation of the intensivication strategy (output productivity) and extensivication strategy (increasing land ) on simulation 5 is less advantageous to the Indonesian macro economy than the simulation on increasing the intermediate input productivity only (simulation 3)

# Impacts on Biofuel and other Sectoral Prices

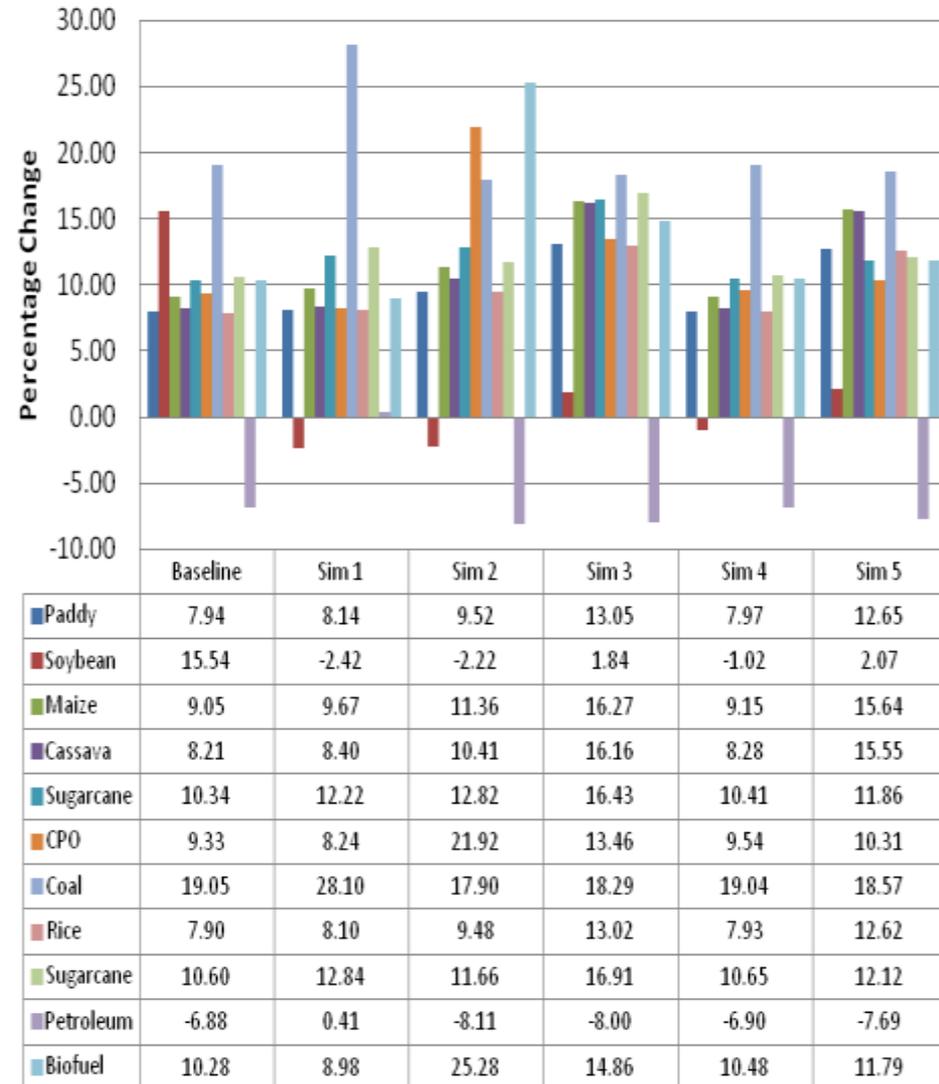


	Baseline	Sim 1	Sim 2	Sim 3	Sim 4	Sim 5
Paddy	12.86	11.40	6.52	-14.49	12.73	-12.67
Soybean	15.54	13.65	11.23	11.44	15.50	12.64
Maize	14.19	13.25	8.59	-12.62	13.80	-11.01
Cassava	14.55	13.21	8.66	-13.90	14.29	-12.18
Sugarcane	4.50	4.40	-0.45	-23.22	4.22	0.39
CPO	4.73	2.61	-95.81	-19.97	3.42	0.06
Coal	11.23	27.65	10.99	12.16	11.23	12.17
Rice	15.16	14.61	11.97	-1.15	15.09	-0.19
Sugarcane	12.81	14.14	11.79	4.66	12.73	12.27
Petroleum	23.44	34.98	23.46	24.78	23.45	24.72
Biofuel	13.36	12.12	-8.81	7.61	13.07	12.04

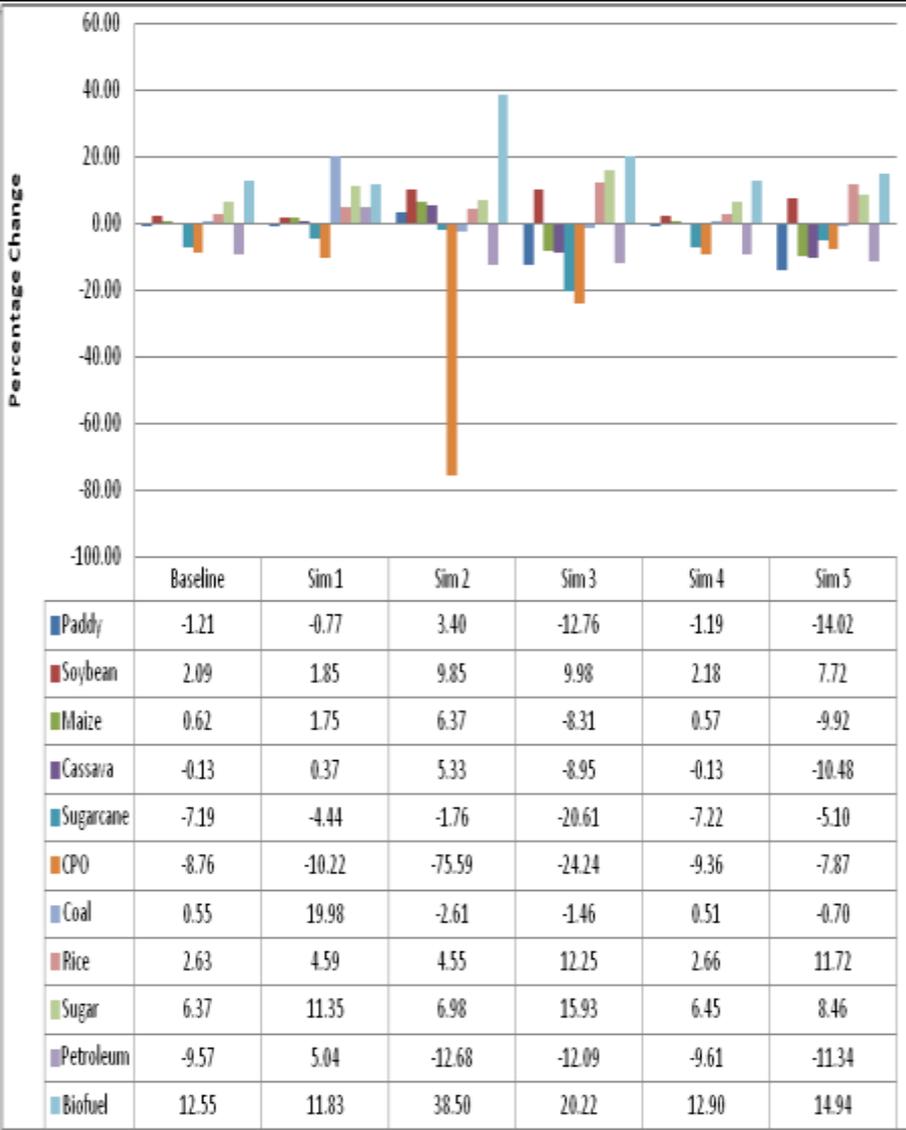
- Biofuel and majority of sectors experience the decreasing of output price compared to baseline.
- Increasing demand of palm Oil and productivity of intermediate good more sensitive to decrease bio fuel price
- However, it is compensated by a decrease on Palm Oil price

# Impact on Biofuel and other Sectoral Output

- The impacts on outputs vary among sectors
- Strong demands for palm oil increase the highest bio fuel output
- Simulation 5 caused an improved performance on biofuel and other sectoral output, but not as big as productivity increase (simulation 3).



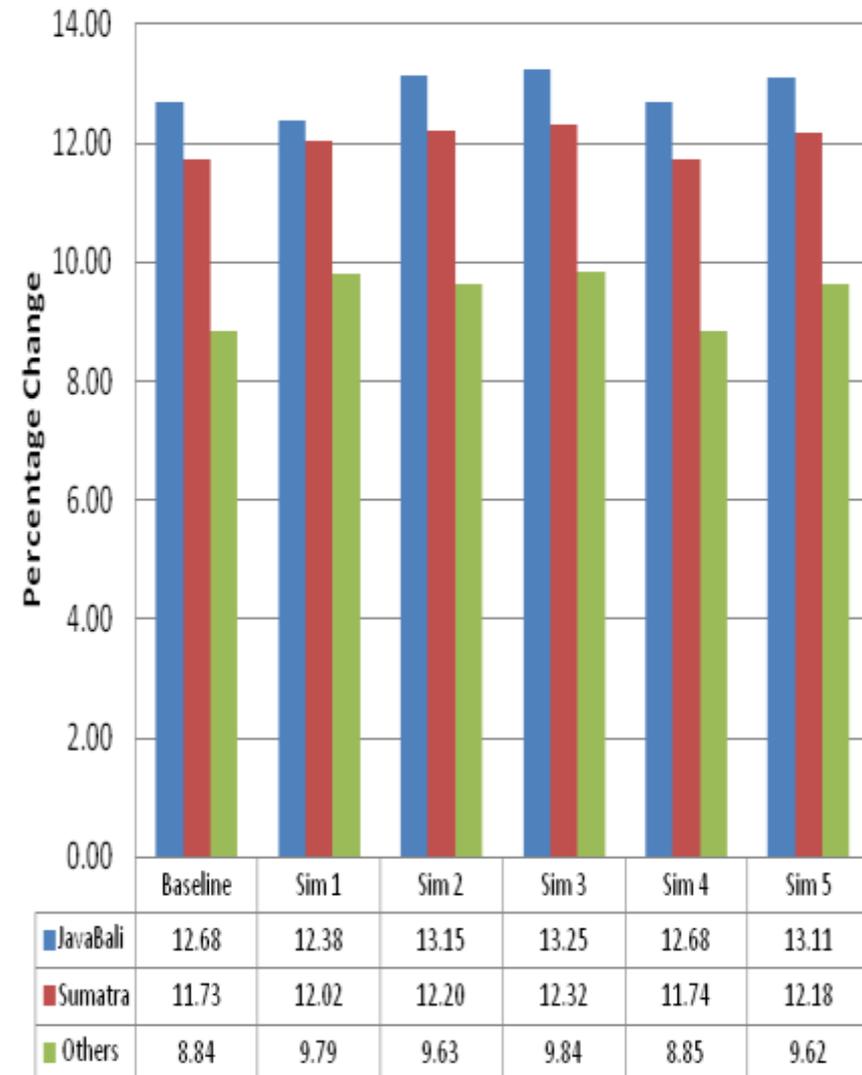
# The Biofuel Impacts on Indonesian Sectoral Labor Absorption



- Increasing demand for Palm Oil increases labour absorption in biofuel sector but decreases in Palm Oil sector
- Increases in the productivity of food crops, sugarcane and palm oil would increase labor productivity of those sectors but at the expense of labor absorption decreases.

# The Biofuel Impacts on Indonesian Regional GDP

- There is a substantial decrease in GRDP of Java-Bali which is the main producer of agricultural commodities and increases in GRDP of Sumatra due to Global price increases (Sim 1)
- Increasing the demand of CPO as intermediate good for bio-fuel lead to increases in GRDP of Java-Bali and Sumatra (sim 2)
- Increased productivity (sim 3) would increase GRDP of all regions more than that caused by expansion of feed stock land (sim 4).



# Concluding Remarks: The Way Forward

- Implementation of the Biofuel Mandate due to an increase in CPO demand causes the most beneficial impact on biofuel development and Indonesian macro economy, but leads to decreases in feed stock prices and labor absorption.
- The most important shock to the Bio fuel development is productivity increases of feed stock (Palm Oil, Maize, etc). This shock leads to increases in RGDP of most regions.
- There is evidence that competition between bio fuel development and food security exists in terms of land, capital and labor. Therefore, Bio fuel development must be carried out carefully by looking at condition of these three inputs in any particular region.

- Major challenges facing biofuel development in Indonesia include :
  1. Further research needed to increase feed stock productivity without causing substantial trade-offs between food, fuels, feed, and forest.
  2. The need for capacity building for policy makers, researchers and academic community, private sectors and academic agencies to improve efficiency and productivity especially of labor

**THANK YOU!**