

## The biofuel regime

A constellation of food, biotechnology,  
climate, energy and automobility.

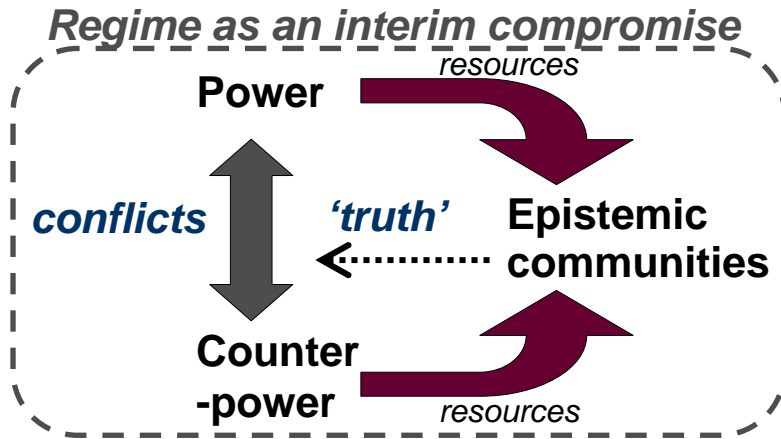
## Feedstock of biofuels

### 1st generation

- Sugar crops
  - Starch crops
  - Oil crops
  - Waste oils
- ⇒ ethanol & biodiesel fuel (BDF)

### 2nd generation

- Cellulosic materials
  - Waste carbohydrate
- ⇒ ethanol, BDF, methanol, FT-diesel, DME, hydrogen



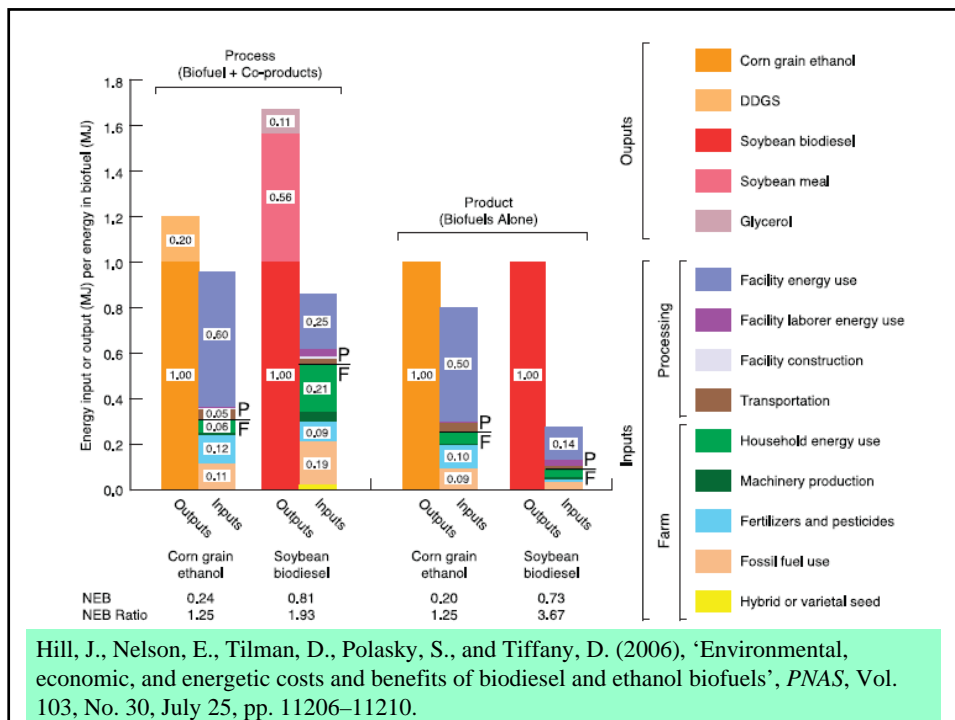
*Epistemic communities shape a regime, creating a cognitive frame, i.e. the regime of 'truth', among actors with social conflicts.*

## Life-cycle assessment (LCA) of corn ethanol in selected studies

studies	Patzek 2004	Pimentel et al. 2005	Graboski 2002	de Oliveira et al. 2005	Gas- oline*	Hill et al. 2006	Wang 2001	Shapouri et al. 2004
Net GHG emissions (gC/MJ)	121	116	99	98	94	85	71	61
Net energy (MJ/L)**	-5.0	-6.1	3.9	1.6	-0.2	5.2	6.9	8.9

\* Farrel et al. 2006.

\*\* Net energy = Output energy – Input energy (MJ/L)



Hill, J., Nelson, E., Tilman, D., Polasky, S., and Tiffany, D. (2006), 'Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels', *PNAS*, Vol. 103, No. 30, July 25, pp. 11206–11210.

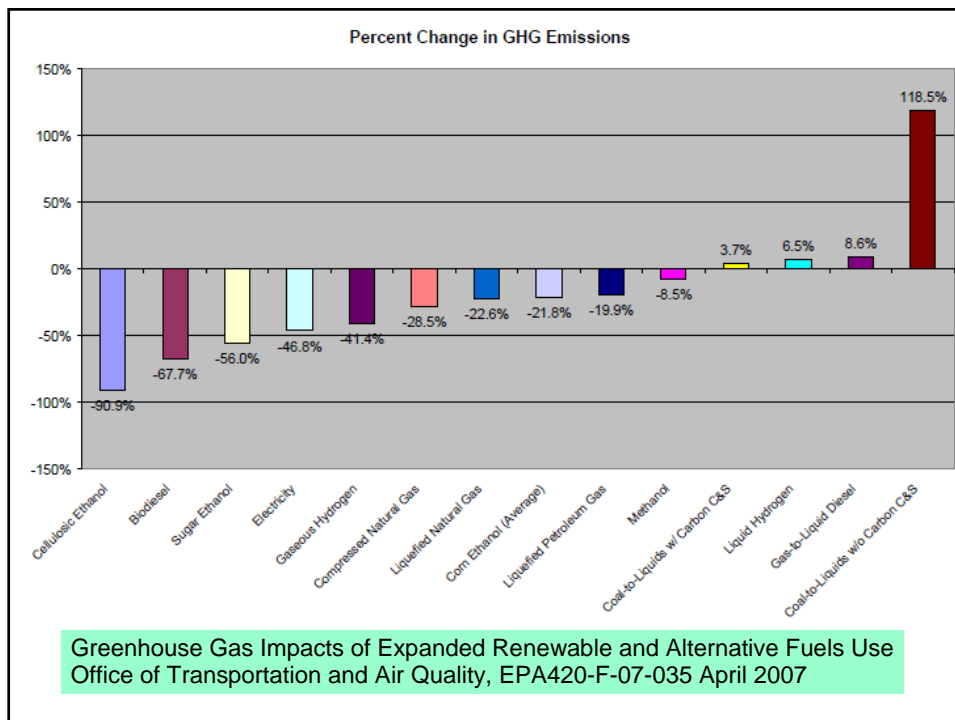
## Life-cycle assessment (LCA) stems from conflicts

- There must be a conflict of opinions on efficiencies of different products.
  - different beverage containers of Coca-Cola in 1969
- The conflict arises from ambiguous impacts of products with long commodity chains.
  - From TEWI to LCCP in assessing the effect of fluorocarbons on climate change

## LCA in rulemaking

“Such analyses are termed *lifecycle analyses*. There is also no consensus on the most appropriate approach for conducting such lifecycle analyses. We have chosen to base our lifecycle analysis on Argonne National Laboratory’s GREET model for the reasons described in Section IX.”

(Renewable Fuel Standard Program under the Energy Policy Act of 2005, Environmental Protection Agency, 2007, Federal Register, 23907, *italic* added)

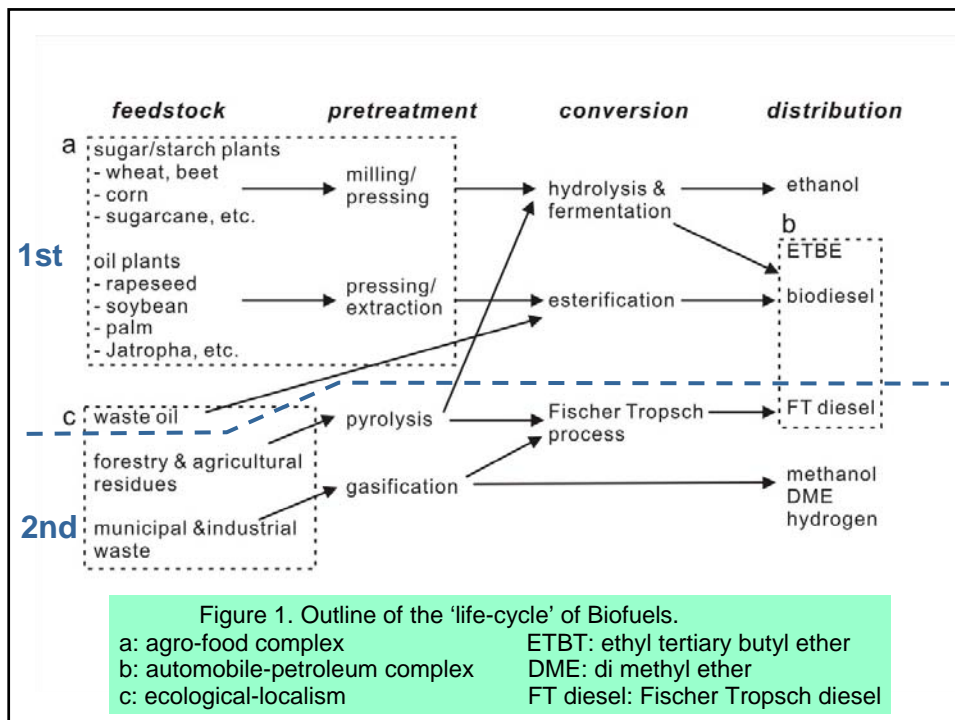


## Section IX, FR, 23907

- “The choice of model inputs and assumptions all have a bearing on the results of lifecycle analyses, and many of these assumptions remain the *subject of debate among researchers*.”
- “There currently exists *no organized, comprehensive dialogue among stakeholders* about the appropriate tools and assumptions behind any lifecycle analyses. We will be initiating more comprehensive discussions about lifecycle analyses with stakeholders in the near future. ”

## Problems in LCA

- Subjective system boundary
- Ambiguous allocation for co-products
- Oversimplification of local diversities
- Limited comparisons within given options



## Constellations around the 'life-cycle' of biofuel

- a) Agro-food complex
  - a-1) Postcolonial-ergocultural regime
  - a-2) Environmental-corporate regime
  - a-3) Biotech-corporate regime
- b) Automobile-petroleum complex
  - b-1) International oil regime
  - b-2) Automobility regime
- c) Ecological-localism

## a-1) Postcolonial- ergocultural regime

**Conflicts:** Legacies of plantations vs. migrant workers, small farmers, deforestation.

**Actors:** Sugarcane, palm, cassava, *Jatropha*; Brazil, Columbia, India, Thailand, Malaysia, Philippines, etc.

**Epistemic communities:** IEA, ESMAP, Biopact

**'Truth':** Trade liberalization, higher efficiency in LCA, certification for sustainable production.

## a-2) Environmental- corporate regime

**Conflicts:** Agribusiness vs. consumers.

**Actors:** Corn, rapeseed, beet, wheat, soybean; US, EU; farmer unions; biofuel producing companies in the North, e.g. ADM, Cargill, etc.

**Epistemic communities:** AEE, EEB, USDA, DOE, etc.

**'Truth':** GHG reduction, energy security, efficiency in LCA.

## Meta regime of LCA

**Biofuel-producing South  
Unsustainable?**

*Trade  
conflicts*



*Certification  
Standardization*

**LCA & other  
impact  
assessment**

**Biofuel-producing North  
Inefficient?**



## Provisional conclusion

- LCA expert will play more significant roles in
  - certification and standardization required by oil and automobile industries, and
  - improving feedstock attempted by biotech companies.
- Thus, an epistemic arena of LCA is emerging,
- which may influence the shaping of future biofuel regime.