Support for biofuels: Considerations for policymakers

International Biofuels Economic Outlook Panel
Global Conference on Agricultural Biofuels: Research and Economics
August 21, 2007
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Political economy of liquid biofuels

Divergent groups favor liquid biofuels

- Agribusiness, farmers
- Governments: energy security, rising oil import bills, job creation, growing fuel subsidies
- Some environmentalists – a wide range of views
- General public appeal of renewable fuel

Complexity of interactions between energy, agriculture, environment, and macro-economy makes it difficult to see the issues clearly
Questions

• How has biofuel economics fared historically?
• Are subsidies a viable policy option for developing countries?
• Can Brazilian experience be replicated?
• Can biofuels mitigate oil price increases and price volatility?
• How are biofuels expected to affect, and be affected by, crop prices in the future?
First-generation liquid biofuels

- Limitations in economics and production potential widely acknowledged
- More than half of production cost due to feedstock
- Domestic production and consumption of biofuels economic under few favorable circumstances (Brazil in 2005 and 2007), but uneconomic most of the time
- Hence heavily protected, mostly domestic, limited trade
- Types of support
  - Fuel tax and other fuel charge/fee reduction (universal)
  - Mandatory blending or consumption requirements
  - Import tariffs (primarily on ethanol)
  - Production-linked subsidies
  - Upstream (OECD agricultural policies) and downstream subsidies
Economics of ethanol production from sugarcane

*83% sugar and 17% molasses, and molasses priced at 25% of sugar; 20% fuel economy penalty for ethanol
Landlocked economies with sugar production cost of $225/tonne

*83% sugar and 17% molasses, and molasses priced at 25% of sugar; transport costs $100 per tonne of sugar & $150 per tonne of gasoline; 20% fuel economy penalty

% of months: 15% since 1990
70% since Jan 2004
Vegetable oil vs. diesel prices

*Price data from USDA FAS, World Bank and Energy Intelligence
Government support for consumers and domestic producers

<table>
<thead>
<tr>
<th>Location</th>
<th>Tax reduction in US$ per liter of biofuel</th>
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<tr>
<td></td>
<td>Ethanol</td>
</tr>
<tr>
<td>Germany</td>
<td>0.83</td>
</tr>
<tr>
<td>Australia</td>
<td>0.33</td>
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<tr>
<td>USA (credit)</td>
<td>0.135</td>
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<tr>
<td>Thailand</td>
<td>0.65 (April 2006)</td>
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<tr>
<td>São Paulo</td>
<td>0.30 (June 2005)</td>
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**High tariffs on ethanol** to prevent subsidies from going to imports
- USA: $0.1427 per liter + 2.5/1.9%
- EU: US$0.26 / 0.14 per liter
- Brazil: 20%
Accounting for environmental externalities

- GHG emission reduction: at $8-20 per tonne of CO$_2$-equivalent, expect about $0.01-0.04 per liter
  - Much smaller than tax reductions provided to biofuels today
- Calculations on US subsidy per tonne of CO$_2$ equivalent (IISD)
  - $520 in 2006 for maize to ethanol
  - $118–147 for cellulosic ethanol if the current subsidy structure is maintained
Factors contributing to large-scale use of ethanol in Brazil

• Extremely favorable natural endowments in the center-south, enabling very low-cost sugarcane production
  ➢ Entirely rain-fed
  ➢ Seemingly unlimited supply of land (although concerns about displacement of virgin cerrados)

• Outstanding agricultural research
  ➢ Each mill uses about 15 varieties of cane
  ➢ Constant development of new commercial varieties
  ➢ Precise computer optimization of every step in the ethanol production process

• Functioning capital market, availability of managerial and technical skills, reasonable infrastructure

• Mandate and fuel tax reduction
Replicability

• About 100 countries grow sugar cane, but none matches Brazilian center-south’s low cost
• Land and water requirements –
  ➢ Zambia has both plentiful land and water, but not necessarily at the same locations
• Capital market and infrastructure development, availability of managerial and technical skills
• Requirement for large fuel tax reductions today ↔ petroleum fuels an important source of government revenue in low-income countries
Can biofuels provide a solution to high oil prices?

- Biofuel production a small fraction of petroleum fuel production for the foreseeable future ⇒ biofuels will be price takers
- Marginal demand and marginal supply set prices ⇒ 1–2% net displacement of global oil demand (2–7% of transportation fuels) might moderate oil price increases
## Land requirements

| First generation biofuels (LMC International) | Displacing 5% of gasoline and diesel worldwide would be a challenge – if distributed globally, 15+% more land (100+ million hectares) |
| Second generation biofuels | Much greater potential because of ability to use wastes, residues, and non-food crops |
Will high oil prices help biofuel economics?

• More room for cost recovery
• Higher production and market delivery costs (e.g., pre-FOB) because of higher energy prices
• If biofuels significantly increase demand for feedstocks, their prices will be driven up
• Increasing link to oil prices
Impact of higher biofuel demand

- Higher production of biofuels will raise food prices
  - Good for producers, bad for consumers, especially the poor
  - Most evidence suggests poor farming rural households are net buyers of food
  - On balance, food security of the poor will be reduced
- Price increase in 2005-2006:
  - 67% increase for maize, 45% for palm oil, 26% for rapeseed oil, 33% for sugar
- Higher crop prices already hurting biofuel industry (e.g., South Africa)
- Correlation with gasoline and diesel prices
  - 75% for sugar and 30% for palm oil since Jan 2002, 75% for rapeseed oil since Jan 2003.
  - Threshold diversion level for strong correlation to emerge?
Concluding remarks

• Reasons for supporting biofuels are attractive: rural development, reducing global warming, enhancing energy security. But a biofuel program may not be a good vehicle for addressing them; separate policy solutions may be more cost-effective.

• The economics of first generation biofuels is very much location-specific, as are environmental benefits.

• Legitimate government support for biofuels is R&D, and useful especially in developing country context.

• For energy security, it would be helpful to view liquid biofuels in context.
Additional thoughts and materials

Available at: