The Biofuels Market: Current Situation and Alternative Scenarios

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United Nations Conference on Trade and Development - UNCTAD

Bali, 12 December 2007
The present market

- Ethanol and biodiesel production is growing rapidly, from 0.4 EJ in 2000 to 0.8 EJ in 2005
- Sugar cane ethanol in Brazil; corn ethanol in US; rapeseed biodiesel in Europe
- Biofuel production and use stimulated by mandatory targets and subsidies
- In US ethanol is used mostly as fuel additive
- 1% of total road transport fuel in energy terms, but impact on food prices and environmental consequences
- Limits of present technology
Technology scenario: Shift to second generation technologies

- Cellulosic or lignocellulosic conversion (crop residues, grasses, woody crops – widespread and abundant)
- At present not competitive: cost 2.1 times higher than the cost of gasoline production. Expectations about future costs vary
- Energy output per unit of land: 60 oven-dry ton/hectare → double than present output using sugar cane
- Competition for land still exists, but less impact on prices
- High oil prices could be a sufficient driver to bring along second generation technologies even if costs do not fall
Production scenario: No climate policy

- Strongly growing production of biofuels beginning after 2020 driven primarily by high oil price (oil price in 2100 over 4.5 times price in 2000)
- In 2050 global biofuels production reaches 30-40 EJ/year (0.8 EJ/year in 2005). 5% of global primary energy use
- In 2100 global biofuels production reaches 180-260 EJ/year. 15% of global primary energy use
- Global land area required for bioenergy production in 2100: 700 million hectares
Production scenario: climate-related constraints

- Carbon policies will result in an increase in energy prices and in demand for carbon-free fuels
- Limited alternatives to power vehicles
- Bioenergy will be more competitive, but the entry depends on the relative price of fossil fuels and biofuels
- The potential of bioenergy is limited by land availability
- Global land area required for bioenergy in 2100: 1 billion hectares
- Biofuels production of 90-130 EJ/year by 2050 and 250-370 EJ/year by 2100. 30% of global energy needs
- Change in energy-producing countries (from fossil fuels to bioenergy) ➔ potential redistribution of wealth, with negative impacts on the Middle East and Russia and the most positive impacts on Latin America and Africa
Intellectual Property Rights

- New private sector biofuel technologies will be under tight IPR protection
- Refineries will require large investment up to $100 million per facility. They will be located near biomass production areas
- ToT will be limited by the scale of operations
- Capital intensity could be a driver in concentrating production in fewer countries
- FDI is expected in biomass producing regions
Large scale use of alternative first generation feedstocks: Jatropha

- Jatropha generally survives drought and flood, but no miracles!
- Main use: to power simple engines
- It could become the feedstock of choice for the EU, without involving exceptionally large cultivation areas
- For this to happen, improvements are needed. Countries like China, India and Indonesia seem better placed than African countries
- Should large scale production of jatropha for fuel use take place, a market should be found for its by-product, glycerin
- Biodiesel cost estimates using Indian jatropha vary from 0.4 to 0.65$/litre, cheaper than using palm oil from Malaysia, and much cheaper than using soybean from US and rapeseed from Europe
- Using jatropha as a feedstock for large scale biodiesel production will lessen pressure on the other seed oils used both for food/feed or for energy
Trade scenarios: 
Unrestricted trade

- Largest biofuel producers: Latin America, Africa and US because of low land prices and high biomass productivity
- Global demand will be supplied by those regions with the lowest cost of production
- Production expands in other regions only when the cost of biofuels rises in a low cost region due to the rise of land prices
- Bioenergy exports are around 18 EJ/year in 2050 and around 125 EJ/year in 2100
Trade Scenarios: Restricted trade

- Policies that block or distort trade will change where biomass is produced.
- Almost all regions of the world will produce bioenergy. Main producers: Latin America, USA, Africa and Europe.
- The level of global bioenergy production is lower in comparison to unrestricted trade.
THANK YOU

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