What's the Matter with Biofuels in the United States?

A comparison between US ethanol efforts and Brazil's sugarcane-based ethanol. Why have Brazil's projects been successful while US efforts have not?

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Outline

• Brazil’s success in the field of biofuels

• The United States' Problems
  • Addiction to fossil fuels

• Solutions: how the US can succeed in ethanol production

• Personal Opinion
Brazil: A Biofuel Success Story

- Economics
  - 1970s oil crisis: oil prices were too high, Brazil needed to find an alternative
  - Natural resources: hydropower and sugarcane
    - Sugarcane can produce ethanol and take the place of gasoline
  - Competition with the oil industry
    - Increase sugarcane development
    - Modifications to sugarcane to be resistant to bacteria and fungi
    - Government subsidies

Brazil: A Biofuel Success Story

- Climate: sugarcane can be grown nearly all year in Brazil
- Sugarcane is a great crop for ethanol production

Ester Sugarcane mill
May, 2012
What are Biofuels doing for Brazil?

- Unique market of alternative energy
- Self-sufficiency; Brazil is not dependent on foreign oil → stability
- Little dependency on oil in general
  - Finite resource, the world cannot survive on oil forever.
  - While the end of oil use is not around the corner, we should be preparing for what will happen in the next 50 years
  - By investigating alternatives at this point, Brazil is taking initiatives that many countries are not

What isn’t working in the US?

- Climate
  - The US climate does not support large scale sugarcane growth

- Cheap coal and natural gas
  - We import oil and drill offshore
  - The US is generally uninterested in moving forward on the biofuel front

- Our response to rising gas prices
  - Hybrid vehicles, carpooling, public transportation
Comparison of corn ethanol and gasoline GHG emissions with and without land use change (CO2 release rate: (g/MJ))

<table>
<thead>
<tr>
<th>Fuel Type (US)</th>
<th>Carbon Intensity w/o LUC</th>
<th>Reduction GHG</th>
<th>Carbon Intensity w/ LUC</th>
<th>Reduction GHG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>92</td>
<td>---</td>
<td>92</td>
<td>---</td>
</tr>
<tr>
<td>Corn Ethanol</td>
<td>74</td>
<td>-20%</td>
<td>177</td>
<td>+93%</td>
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<tr>
<td>Cellulosic Ethanol</td>
<td>28</td>
<td>-70%</td>
<td>138</td>
<td>+50%</td>
</tr>
</tbody>
</table>

Corn ethanol failure
Essentially, it takes more energy to produce corn than the biofuels from corn would be providing

Timothy Searchinger et al. (2008-02-29).m”USE of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change.”
The US addiction to Fossil Fuels

- US oil corporations have a lot of influence over the US economy
  - This makes policy changes very difficult

- Oil companies and investments into alternative energy
  - BP: “beyond petroleum”
  - Shell: focus on biofuels
    - Frozen investments on wind, solar.
  - It is important that oil companies stick to these commitments to renewables

The US addiction to Fossil Fuels

- The American attitude
  - Not much concern for the environment
    - Fracking and MTR reflect this
    - We aren’t at a critical point yet
  - “False choice” philosophy
    - A country cannot be environmentally conscious and have it’s economy grow at the same time

“Ethanol Market Penetration”. Alternative Fuels and Advanced Vehicles Data Center, US DOE.

Solutions: how can the United States succeed in ethanol production?

- When do biofuels work?
  - When there is economic incentive; can we adopt a similar method to that of Brazil with government subsidies?
    - Probably not, we are not at a critical point yet.
  - Using crops with a low energy input and high energy output, i.e. Not corn…
    - Sugarcane is a good example! However, the US climate is not ideal for sugarcane production
Solutions: how can the United States succeed in ethanol production?

- Current ideas
  - Convert algae into butanol
  - Methanol from pyrolysis of organic matter
  - Cellulosic biofuels
  - Cyanobacteria

- WUSTL: Biodiesel powers WUSTL Dining Services truck
  - Vegetable oil from our campus kitchens is used as biodiesel in our dining services vehicles on campus
WUSTL Dining Services Bio-Diesel Truck

http://wustl.edu/initiatives/sustain/strategicplan-final/biodiesel.html
Support for biofuel production in the US

- Biofuel production in Brazil has done great things for their economy and has made them a leader on the renewable energy front.

- Can the US be a leader in this field as well?
  - Yes; we have great research institutions and the technology to move forward.
    - Particularly cellulosic biofuels and butanol
  - What we need is incentive and an attitude change
  - If successful, biofuels will help the US in many ways:
    - Less dependence on foreign oil, self-sufficiency
    - New markets in flex-fuel car production, agricultural development, implementation and logistics
    - Jobs at home → economy boost with new markets
"You've got to overcome your dependency on fossil fuels."

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