“If Biofuels are the answer – What is the question?”

A review on the benefits and drawbacks of biofuels from an environmental, development, and climate perspective

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Structure

1. Background for the globally rising interest in biofuels
2. Selection of international policy actions so far
3. Some biofuel technology basics
4. Review of the benefits and drawbacks
   • Climate
   • Environment
   • Development
5. Conclusions: What role can biofuels play?
6. Discussion
Backgrounds for rising policy interest

1. **Energy security**: independence from foreign sources/ rising energy prices
2. **Climate Change**: Reduction of GHG emissions
3. Supporting more **environmentally friendly energy sources**
4. **Technology/ innovation**, access to markets
5. **Development aid**: Eradicating extreme poverty in developing countries
6. **Support for farmers**: rural development

Denver University, March 5, 2008, Stephanie Schlegel
Selection of international policy actions so far

- EU „Climate and Energy package“:
  - 10% biofuels of transportation fuels by 2020
  - 20% renewables of overall energy consumption by 2020

- US Energy Independence and Security Act (December) 2007
  - Renewable Fuels Standard: up to 36 billion gallons a year by 2022, of which 21 billion gallons must come from futuristic biofuels, such as cellulosic ethanol
3. Some biofuel technology basics

Variety of feedstocks

Variety of use options
3. Some biofuel technology basics

German Newspaper „BILD“ 2005:

„German Inventor can produce gasoline out of cats“

...It needs 20 cats for a tankful...
Solid (e.g. woodchips), Gaseous (e.g. biogas), Liquid (Bioethanol, Biodiesel, Plantoil)

bioenergy that can be used for transport or electricity and heating purposes
Biofuels: Reduction of GHG?

Fossil fuel → Biofuel

On a first sight:
→ carbon neutral
→ 100% savings of fossil energy sources

Why Life Cycle Assessment?

Source: EMPA
Life Cycle Assessment:
Fossil Energy Demand of Biofuels

- Planting
- Cultivation
- Harvesting
- Processing
- Transport

Material flows
Fossil Energy flows

Seed Production
Fertilizer Production
Tractor Production
Auxiliaries Production
Truck Production
Car Production

Setting up Seed Plantation
Building of Fertilizer Plant
Building of Tractor Plant
Building of Chemical Plant
Building of Truck Plant
Building of Car Plant

Source: EMPA
Fossil Energy Demand of Biofuels

Fossil energy demand of car use (as % of petrol-fueled car)
Source: EMPA
Reduction of GHG Emissions by Feedstock Type

Figure 5. Potential Reductions in GHG Emissions, by Feedstock Type

Source: IEA
Land use changes and GHG emissions

• Actual GHG even worse, since current Life Cycle Assessments hardly consider:
  • Impacts of land use changes
    • *E.g. TNC 2008*: converting rainforests, peatlands, savannas or grasslands to produce biofuels in Brazil, southeast Asia and the US releases up to **420 times** more CO2 than the carbon reductions these biofuels provide.
  • No consideration of indirect land use changes and alternative land uses
    • *E.g. Searchinger (Science, 2008)*: When indirect land-use changes are factored in, corn-based ethanol production doubles GHG
    • *E.g. Righelato and Spracklen, (Science, 2007)*: Forestration of an equivalent area would sequester two to nine times more carbon
Main Environmental impacts

Depending on the production methods/ feedstocks/regional circumstances

- Loss of **biodiversity**
- **Soil** degradation, e.g. erosion/ pollution
- Contamination/ Depletion of **Water sources**
- **Land conversion**/ Competition with other land uses
- **Intensification**/ expansion of monocultures/ GMO’s
Bioenergy yields/ha - different technologies

Source: SRU 2007
Biofuels land use requirements - examples

• **EU** would need **72%** of its agricultural land to produce **10%** of its entire fuel consumption.

• **Brazil** would need only **3%** of its agricultural land to produce **10%** of its entire fuel consumption.

• The **U.S.** would need **30%** of its agricultural land to produce the **same quantity** than Brazil

Source: WWI 2006/Dimas 2007
Biofuels – opportunity or challenge for DC?

- **Food sovereignty**
  - increased food prices/ reduction of global food reserves or beneficial for DC?
  - Current world food prices are on their highest levels since 1990 (increase between 2006 and 2007: 25%)

- Concern that benefits go to **multinational corporations** rather then contributing rural development in DC

- **Land rights**

- **Working conditions/ Workers rights**
Efficiency of biofuel support schemes

- **Energy security**: independence from foreign sources/ rising energy prices
- **Climate Change**: Reduction of GHG emissions
- More **environmentally friendly energy source**
- **Technology/ innovation**: access to markets
- **Eradicating extreme poverty** in developing countries (Quote FAO)
- **Support for farmers**: rural development

Not efficient
Depends (big difference)
Depends (big difference)
Efficient/ Depends
Depends
Efficient/ depends

-> biofuels are not a proxy for sustainable energy/ GHG savings
It all depends!
What role can biofuels play?

1. Priority for energy resource efficiency and savings
2. Feedstocks: Biomass utilization cascade – waste and agricultural residues as priority feedstock
3. Selecting sustainable/efficient production and technology pathways (which is not liquid biofuels!)
4. Regionally adapted production and use/ production and use in the same country
5. Needs Integrated policy approach
   - agricultural policy
   - land use policy: minimize competition with other land use requirements
   - transport etc.
6. Under certain circumstances: certification systems
Thank you!

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