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New Jersey Agricultural Experiment Station

Sustainability of Low Carbon Fuels

Margaret Brennan-Tonetta

Associate Director, Rutgers New Jersey Agricultural Experiment Station

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Sustainability Standards for Low Carbon Fuels

Environmental	Socio-Economic
GHG Emissions	Community Impacts
Water Use, Water Pollution	Net Employment
Agro-Chemical Use	Child Labor/Human Rights
Biodiversity	Environmental Justice
Soil Erosion	Participatory Planning
Forest Cover	Food Security
Direct/Indirect Land Use Change	Production Efficiency

LCA should be a component of sustainability, not vice versa.

LCA is a tool for comparing alternatives - helps identify "best" use based on environmental impacts – is recycling, bioenergy or land filling a better option for waste products?
Issues: Objective – fossil energy savings, efficient use of resources, GHG reduction, costs, …
System boundaries; Time horizon; Base case fossil fuels – expected level of penetration?

The BIG Challenge:
How to find the best compromise between credibility, complexity and reality?

Things to Consider in Developing Sustainability Standards*

- Establishing a screening criteria to determine compliance with standards means that applicants must submit enough information to know if a "sustainability test" has been met-
    - Reasonable Constraints or
    - Undue Burden on Emerging Technologies?
- How Much Better is Best? = Thresholds
    - Better Than Current Practices for Non-Sustainable Industries?
    - No Net Loss or Change from Status Quo?
    - No Unacceptable Change?
    - Biofuel Production may mean using more resources:
        - Land, water, fertilizer, chemicals, labor, energy
- Is a sustainable practice different than current regulatory standards? Does compliance equal sustainability? Particularly relevant to social justice standards.
- What are the economic implications of the standards? Market impacts?
- What are the technological hurdles to achieving the standards?

*California Energy Commission, 2008

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More Things to Consider*

- What is the boundary of the physical, geographic or social system?
- What is the timeline for the system we are considering: one year, 50 years?
- Scale Issues:
  - GHG emissions are global pollutants
  - Water use is regional
  - Wastewater discharge may be a localized issue
  - Indirect land use changes are global, regional and localized
- How much of what information is needed to determine if an alternative fuel or vehicle technology is “sustainable?”
- Who provides the information and analysis?
- Do information claims on sustainable products and processes need to be certified by third parties?
- Are all metrics and parameters given equal weight, or are some more important than others?

Remember: Information costs money to compile and manage

*California Energy Commission, 2008

Research yielded six major findings about our biomass resources:

1. New Jersey produces an estimated 8.2 million dry tons (MDT) of biomass[1] annually.
2. Screening process developed to estimate practically recoverable biomass. Approximately 5.5 MDT (~65%) of New Jersey's biomass could ultimately be available to produce bioenergy.
3. **Almost 75% of New Jersey's biomass resources produced directly by state's population, majority in solid waste** (e.g., municipal waste). Biomass concentrated in central and northeastern counties.
4. Agriculture and forestry management also important potential sources of biomass, account for majority of remaining amount.
5. New Jersey's estimated practically recoverable biomass resource of 5.5 MDT could deliver up to 1,124 MW of power, (~9% of New Jersey's electricity consumption) or **311 million gallons of gasoline equivalent** (~5% of transportation fuel consumed) <u>if appropriate technologies and infrastructure were in place.</u>
6. Large proportion of waste-based biomass supports recommendation that New Jersey pursue development of an energy from waste industry.

1. This total includes biogas and landfill gas quantities converted to dry ton equivalents on an energy basis. This does NOT include biomass that is currently used for incineration or sewage sludge because these are not classified as Class I renewable feedstocks in NJ.

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Landfill Burdens and Benefits*

Life Cycle Burdens

- Energy and emissions associated with material inputs (e.g., liner)
- Energy and emissions associated with landfill operation
- Landfill gas contains about 50% methane which is a potent greenhouse gas.
- Energy and emissions associated with leachate collection and treatment

Life Cycle Benefits

- Energy recovery and offset of utility sector emissions
- Revenue from sale of energy
- Assumed gas collection efficiency can significantly impact carbon emissions
- LCA starts at landfill simplifies assessment
- No CO_2 emissions from land use changes

*RTI, International, 2008

Energy from Waste – Summary*

- Municipal solid waste can provide feedstock for bioenergy production…but perhaps challenging to use.
- All waste management options cost money, consume energy, and create environmental burdens.
- Alternative options can create significant energy related benefits:
  - Energy savings (recycling, composting)
  - Energy production (LFG to energy, WTE)
  - Where is the tipping point between energy consumption and energy savings/production?
  - Energy savings/production from waste can also produce significant Savings of GHG emissions.
  - Source reduction is perhaps a win-win option.

*RTI, International, 2008

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Full New Jersey Biomass Assessment Report and Bioenergy Calculator is available on-line at:

njaes.rutgers.edu/bioenergy

Contact Information

Margaret Brennan-Tonetta

732-932-1000 x569

brennan@aesop.rutgers.edu