

Sustainability research: Common goals & stakeholder perspectives on priorities

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With thanks to US DOE, Bioenergy Technologies Office team
including Jonathan Male, Jim Spaeth & Kristen Johnson.

Bioenergy Sustainability Conference

Nashville TN • Oct 22, 2019



Panel – Perspectives on research priorities

See separate presentations by Don Scott on biodiesel (<https://www.biodiesel.org/>), Jenn Jenkins solid wood bioenergy (<http://www.envivabiomass.com>). A few examples from ethanol (<http://poet-dsm.com/liberty>) shared in following slides

BIOENERGY SUSTAINABILITY CONFERENCE

October 21-22, 2019 | Nashville, TN

Objectives

- What do future users of improved technology see as ***priority research needs***?
- How do researchers interact with existing bioenergy ***industries & sustainability compliance*** programs?
- How do current research initiatives compare to perceived needs?
- Strategic opportunities & most effective path forward?

Research to better document effects of renewable fuels in these 6 areas can support better planning and decisions

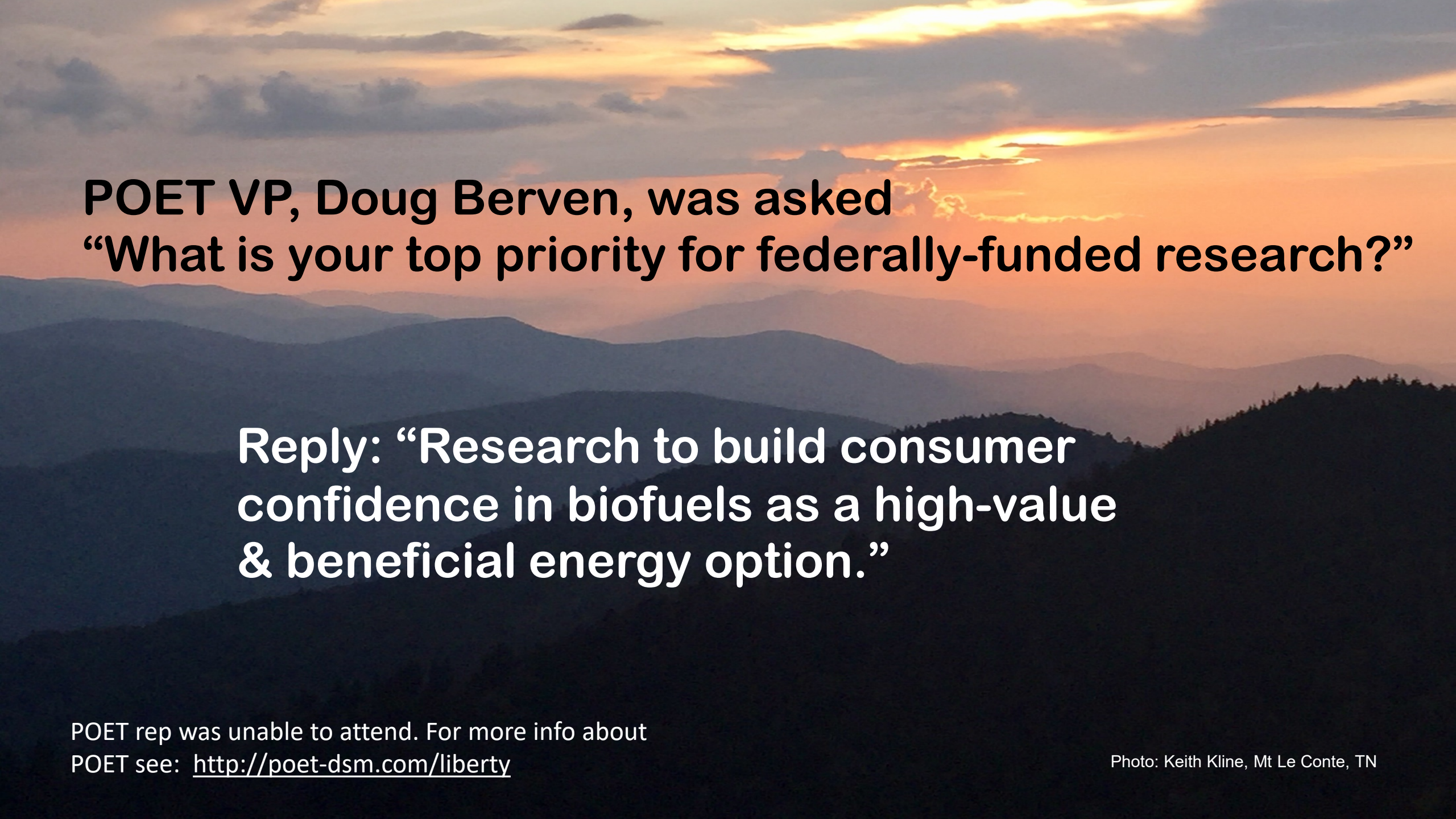
RFS 2022 AND BEYOND



When setting annual biofuel volumes after 2022, the EPA is required by law to consider the following six factors:

- 1 Environmental Impact
- 2 Energy Security
- 3 Anticipated Renewable Fuel Production Levels
- 4 Fueling Infrastructure Capacity
- 5 Cost of Fuel
- 6 Rural Economic Development

Industry perspectives... POET rep was unable to attend.
For more info, see: <http://poet-dsm.com/liberty>



**POET VP, Doug Berven, was asked
“What is your top priority for federally-funded research?”**

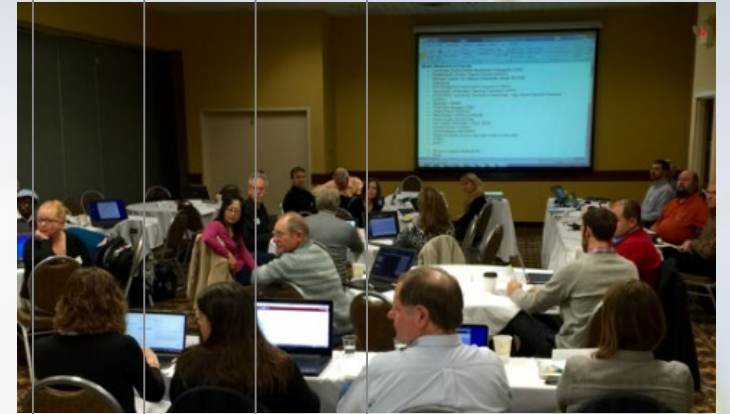
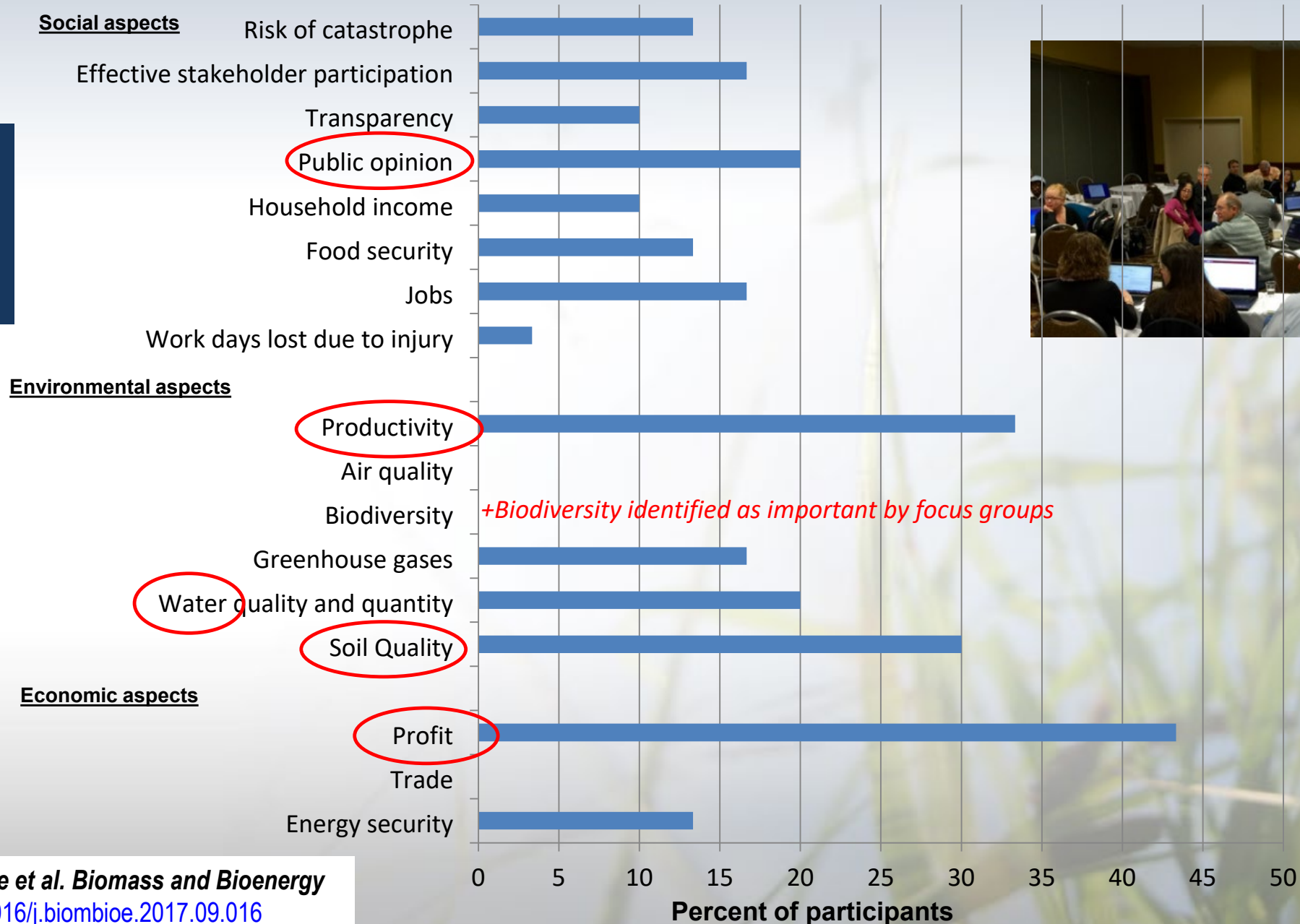
**Reply: “Research to build consumer
confidence in biofuels as a high-value
& beneficial energy option.”**

POET rep was unable to attend. For more info about
POET see: <http://poet-dsm.com/liberty>

Photo: Keith Kline, Mt Le Conte, TN

Iowa landscape design stakeholders prioritize indicators

Another example of research priorities



Source: Dale, Kline et al. *Biomass and Bioenergy*
<https://doi.org/10.1016/j.biombioe.2017.09.016>

Current sustainability research / Perceived needs

BRCs aim to “improve” –

Yields (biomass/ha)

Resilience (droughts, temp...)

- **Water-use** efficiency (WUE)
- **Nitrogen-use** efficiency (NUE)
- **Resistance to pests, pathogens**

Microbial roles, associations

Genetics – for all of the above plus deconstruction (crops and microbes)

Feedstock uniformity
(composition over time, environments)

Modeling, TEA, LCAs... integrated systems analysis

BRCs’ focus areas:

Early-stage research

“Marginal lands”

New bio-based co-products & processing technologies

Selected crops (genetic improvement, experiments)
poplar

- sorghum
- Switchgrass
- Miscanthus
- energy cane
- prairie grasses...

Selected **field trial sites**, labs

Modeling

Other perspectives on priority R&D needs

“Improve” compared to what?


Tech & monitoring: effects of current practice (A) and identifying site-specific opportunities for improvement (B). How to get from A → B with emphasis on:

- **Current crops, productive lands**
- **Water-riparian systems**
- **Landscape multi-function/services including people (urban interface)**

Soils + microbes – for carbon, productivity, climate...

Work to improve economic viability of existing systems, value propositions

Research & communications to increase social acceptance.
- Don't propagate myths -



**To meet future needs for food,
energy, water & nature, soils matter**

**A lot of research is needed on context- specific interactions
among land management–soil health–microbial communities...**

“Rather than 4 BRCs, we could use 400.”

Panel Discussion – Perspectives on research priorities

(a few notes from the discussion)

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Priority areas: How can we best...

1. Improve understanding of dynamics in current landscapes (incl. soils, microbiomes)?
2. Integrate producers & consumers in research and modeling?
3. Increase beneficial collaborations with
 - a) Private sector
 - b) BETO & BRC sustainability projects
 - c) Sustainability compliance organizations
 - d) Other agencies
4. Improve science-based sustainability communications?
5. Provide the right incentives for good land management?

Final panel discussion: priority areas for increased R&D for bioenergy sustainability

(list continued from prior slide; K. Kline notes)

1. **Improve understanding & communication of the role bio-based industries already play and the many opportunities to increase benefits to society**
2. **Develop, apply & share new tools and technologies to monitor what is actually happening on our landscapes. Need more emphasis on collecting the right data (above and below ground stocks and flows of carbon and nutrients, for example) rather than arguing over what happened in past or about land cover classes (grassland vs cropland)**
3. **Document the value propositions of improving land management associated with existing industries (productive landscapes should be high priority)**
4. **LCA & TEA to quantify value of bioenergy as a complement to intermittent renewables**
5. **Invest in more social science research**
6. **LCA & TEA to illustrate importance of MARKETS as incentives to keep land under productive management (forests and agriculture)**
7. **More investment in “concise, clear science results via media to reach general public”**
8. **Utilization of co-products/residues from current US bio-based industries**
9. **How to establish effective market incentives to reduce emissions, pollution, waste**
10. **Invest in sampling, analyzing and understanding dynamics in soils under different management and environmental conditions, including microbial community interactions with different management practices, to identify options to increase carbon storage and productivity.**

Thank you!



<http://www.ornl.gov/sci/ees/cbes/>



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Analysis and Sustainability

Strategic Goal: *Develop science-based strategies to understand and enhance the economic, social, and environmental benefits of advanced bioenergy relative to conventional energy systems.*

Approaches:

- Develop and maintain analytical tools, models, methods, and datasets to support science-based quantification and improved decision-making.
- Ensure high-quality, transparent, reproducible, peer-reviewed analyses.
- Explore the impact of emerging opportunities and identify R&D needs and critical metrics to enable new ideas.
- Develop sustainable system designs that increase bioenergy production while enhancing economic, social, and environmental outcomes.
- Ensure broad engagement with stakeholders.



Enhancing the Economic, Social, and Environmental Benefits of a Growing U.S.

US Dept. of
Energy
Bioenergy
Technologies
Office

Data, analysis
& modeling
sustainability
(led by Kristen
Johnson)

www.energy.gov/eere/bioenergy

Analysis and Sustainability

Strategic Goal: *Develop science-based strategies to understand and enhance the economic, social, and environmental benefits of advanced bioenergy relative to conventional energy systems.*

How to communicate science?

- while enhancing economic, social, and environmental outcomes.
- Ensure broad engagement with stakeholders.



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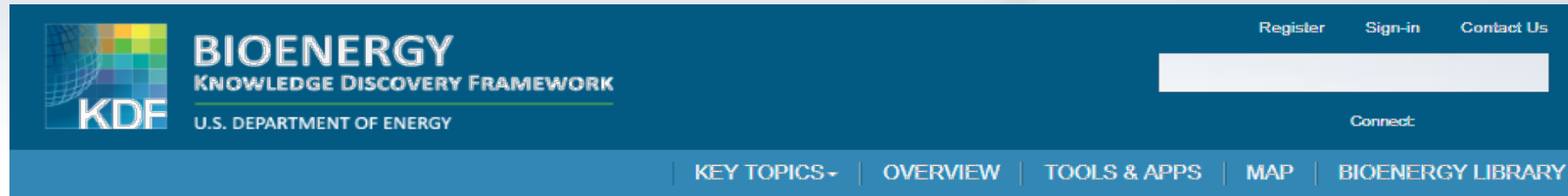
<https://www.energy.gov/eere/bioenergy/2019-project-peer-review>

2019 PROJECT PEER REVIEW

U.S. DEPARTMENT OF ENERGY
BIOENERGY TECHNOLOGIES OFFICE

**Get details on federally-funded research projects.
The reviews and reports are available to the public.**

Share research results through web-based platforms such as the Bioenergy KDF and (soon) BioSTAR



BioSTAR - Bioenergy Sustainability Tradeoffs Assessment Resource

The Bioenergy Sustainability Tradeoffs Assessment Resource (BioSTAR) tool (Figure 1) is being developed by Oak Ridge National Laboratory, U.S. Department of Energy's BioEnergy Technologies Office (DOE BETO). BioSTAR is designed to help stakeholders quantify and assess the tradeoffs of cellulosic biomass production systems (Figure 2).



Enable web-based Stakeholder interaction with

- Case Study examples
- Indicator datasets
- User-contributed datasets

for improved decision-making

Engage stakeholders and local communities in process



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