

# Center for BioEnergy Sustainability

## Accomplishments and Activities

February – September 30, 2009

### Technical Workshops

- **Sustainability of Bioenergy Systems: Cradle to Grave: A Workshop for Oak Ridge National Laboratory, the U.S. Environmental Protection Agency, and their collaborators.** A workshop for Oak Ridge National Laboratory (ORNL), the U.S. Environmental Protection Agency (EPA), and their collaborators was held on September 10 and 11, 2009, at ORNL. The informal workshop focused on “Sustainability of Bioenergy Systems: Cradle to Grave.” A Live Meeting session was conducted over the Internet, allowing access from 28 individuals and institutions across countries and states to participate in the workshop from their remote locations. The topics covered included sustainability issues associated with feedstock production and transport, production of biofuels and by-products, and delivery and consumption by the end users. The overall goals of the workshop were to share information about the participants’ activities in this area and to identify immediate and long-term needs and opportunities for collaboration. The workshop also created opportunities to develop a systems perspective and to present key issues toward a workable definition of bioenergy sustainability. As a result of the workshop efforts, ten committees have been formed, consisting of members from both ORNL and the EPA to define initial assessment plans and opportunities for collaboration. The committees’ findings are scheduled to be reported back to the steering group by mid-November of 2009.  
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- **Land-Use Change and Bioenergy Workshop.** Oak Ridge National Laboratory hosted and supported DOE with planning and organization of an international workshop on Land-Use Change and Bioenergy, in Vonore, Tennessee. The workshop was sponsored by the U.S. Department of Energy (DOE) Biomass Program and was held from May 11 to May 14, 2009. More than 50 experts working on land-use change (LUC) issues around the globe gathered to review the state of the science, identify opportunities for collaboration, and prioritize future steps for research needed to address key issues in land-use change. Participants engaged in a series of small-group sessions to discuss the current suite of model assumptions, available global data sets, disconnects between model needs and data availability, and proposed research needs. Research plans were discussed to respond to key issues and gaps in current understandings and implementations of LUC modeling related to bioenergy. Participants recognized the importance of biofuels in a sustainable energy future and suggested that the development of a comprehensive framework to understand the impact of bioenergy policy on land-use decisions is necessary. An additional 15 groups and individuals from around the world accessed the workshop’s plenary sessions via a Live Meeting session on the Internet.  
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## **Monthly Forums**

Summaries of all the monthly CBES forums appear on the Center's website.

- **Implementing the Cellulosic Biomass Industry in Tennessee** (September 17, 2009) –Dr. Kelly Tiller, Associate Professor and Director of the External Operations at the Office of Bioenergy Programs at The University of Tennessee as well as President and CEO of Genera Energy, LLC.
- **Land-Use Change** (August 20, 2009) – Keith Kline, Environmental Sciences Division, ORNL: *Land* and the impacts of land use underlie current concerns with bioenergy. Debo Oladosu, Environmental Sciences Division, ORNL: Assumptions and methods of operation skew the impacts projected by land-use models currently being applied to biofuel production.
- **BioEnergy – Climate Coupling** (July 16, 2009) – Virginia Dale, Director of CBES, Environmental Sciences Division, ORNL: “The Energy-Climate Change-Land Use Nexus.” John Drake, Computer Sciences and Mathematics Division, ORNL: “BioEnergy – Climate Coupling, a Laboratory Directed Research and Development Project for Projecting the Potential and Impact of Biofuels.”
- **Landscape Design for Bioenergy Sustainability** (June 18, 2009) –Mark Downing, Environmental Sciences Division, ORNL: “A Framework of Landscape Design for Bioenergy.” Timothy Rials, Director, Tennessee Forest Products Center The University of Tennessee: “Sustainable Switchgrass Production for Biofuels in East Tennessee.” Pat Mulholland, Environmental Sciences Division, ORNL: “Water Quality: A Landscape-Design Issue Because of Eutrophication from the Runoff of Fertilizers.” Esther Parish, Computational Sciences and Engineering Division, ORNL: “A Geographic Information System to Incorporate Environmental Considerations into Switchgrass-Production Siting Decisions.”
- **Land-Use Change and Bioenergy Workshop: A Review and Summary** (May 21, 2009) – Raju Vatsavai, Computational Sciences and Engineering Division, ORNL, and Keith Kline, Environmental Sciences Division, ORNL.
- **Integrated, Decision-Engineering Framework for Understanding BioEnergy Sustainability** (April 16, 2009) – Rekha Pillai and Mike Hilliard, Decision Engineering Group, ORNL.
- **Measurement Science and Systems Engineering** (March 19, 2009) – Kenneth Tobin, Director, Measurement Science and Systems Engineering Division, ORNL.

**CBES Opening Ceremony** (Feb. 26, 2009) – A new center was launched by Oak Ridge National Laboratory to provide a means to integrate the diverse research on bioenergy sustainability via fostering communications and outreach. The Center for BioEnergy Sustainability pools the efforts of more than 80 ORNL scientists in the fields of energy, environment, biochemical engineering, economics, transportation, satellite data analysis, and other areas. Center Director Virginia Dale said the collaborative, multidisciplinary initiative will help scientists better understand the impacts and effects of bioenergy production and use and will help discover ways to make such production and use sustainable. “Bioenergy will work, but we’ve got to be smart; we’ve got to do it right,” said Dale, a landscape ecologist and ORNL Corporate Fellow who studies causes and effects of land-use changes. “This center will enable us to do that. Our goal is to foster communication and integrated research on ways to develop and provide the essential data and analysis on sustainability for bioenergy decision makers and stakeholders.” The center is funded through the Lab’s Environmental Sciences Division. “Biofuels are part of the solution, not the problem,” ORNL Director Thom Mason said at a ceremony to dedicate the new center. This center will demonstrate how ORNL can help provide the scientific foundation to better enable implementation of successful strategies, target realistic goals, and predict potential effects with greater confidence. The new center announcement coincided with publication of an article by Dale and some ORNL colleagues in the Spring 2009 journal, *Issues in Science and Technology*. (<http://www.issues.org/>). The paper, titled “In Defense of Biofuels,” summarized the ORNL team’s analysis of research data related to how biofuels affect the environment, the economy, and other aspects of society.

## **Invited Talks**

- Virginia Dale gave a presentation “Sustainability Considerations in Bioenergy Development” on September 16 at ORNL to representatives from the French biofuel industry. Members of the French Biofuels Mission included Michel Delmas (Professor, University of Toulouse), Sophie Groeber (Student, ENSAIA, National School for Agronomy and Food Science), Bernard Kurek [Senior Scientist, INRA (Institute for Agronomical Research)], Christophe Luguel (Head of International Affairs, Competiveness Cluster Industries and AgroResources), Antoine Margeot [Project Leader, IFP (Institut Français du Pétrole)], Adèle Martial (Scientific Attachée, Office of Science & Technology, Embassy of France), and Daniel Thomas (President, Competiveness Cluster Industries and AgroResources).
- Keith Kline was invited to make two presentations in the National Science Foundation sponsored Workshop on Land Use & Geospatial Aspects of Life Cycle Analysis for Renewable Energy in Boston, Massachusetts, September 28 to 30. Keith shared results of recent economic modeling and research conducted with ORNL colleagues Oladosu, Dale, Efrogmson, and others.
  - ❖ The first presentation, at a biomass-technology session chaired by Shelie Miller (Clemson), addressed “Bioenergy Implications for Land Use and Land-Use Change (U.S. and Globally).” It included a discussion of land-use-change issues that are and are not reasonable to relate to bioenergy expansion. It also reviewed the results from the Vonore workshop in May 2009 on Land-Use Change and Bioenergy.

- ❖ The second presentation, for a panel discussion chaired by John Sheehan (University of Minnesota) that included co-panelists Lee Lynd (Dartmouth), Nathanael Greene (NRDC), and Jason Hill (University of Minnesota) addressed “Problems and Uncertainties Associated with Measuring and Assigning Causes for Land-Use Change”.
- Debo Oladosu presented, “Land-Use Impacts of Corn Ethanol: Reconciling Models, Empirical Data, and Policy” at the National Corn Growers Association Conference on Land Use and Carbon Impacts of Corn-Based Ethanol, in St. Louis, Missouri, on August 26, 2009. Sponsor Zia Haq distributed the presentation to DOE-OBP, with Program Manager Jacques Beaudry-Losique and others noting, “This very important work by ORNL using GTAP shows that biofuels-induced indirect land-use change impacts can be minimal.”
- Keith Kline participated in a workshop in Atibaia, Brazil, on “Biofuel Technologies and Their Implications for Water and Land Use.” The workshop, funded by the National Science Foundation, was intended to foster collaborative research among the United States, Brazil, and Argentina on issues related to biofuel production: land-use change, water quantity and quality, air pollution, greenhouse-gas emissions, and life-cycle analysis.
- Keith Kline and Virginia Dale provided advice, data, and slides on sustainability issues for biofuels to assist Brad Gustafson (DOE-FEMP Applied Technologies Supervisor) to prepare a presentation for the GovEnergy Conference, “Charting a Course to Energy Independence,” August 12-19, 2009, in Providence, Rhode Island.
- Keith Kline and Virginia Dale participated in a workshop on sustainability regarding future activities of the PETRONAS Renewable Energy Laboratory on July 7, 2009, at Battelle Columbus (Ohio). Virginia gave a presentation on “Evaluating Sustainability of Renewable Energy,” and Keith gave a presentation on “Sustainability Concerns in Developing Countries.”
- On June 24, Virginia Dale, Keith Kline, and Rebecca Efroymson presented Ecological Sustainability Considerations in Bioenergy Development as part of a technical session on Sustainable Forestry in a Changing Regulatory and Economic Environment at the Southern Regional Meeting of the National Council for Air and Stream Improvement (NCASI), June 24, 2009, in Chattanooga, TN.
- On May 20 Virginia Dale gave a presentation on the Analysis of Bioenergy Sustainability Research by ORNL and DOE via live Internet conferencing to the project leaders of the Southern Research Station for the USDA Forest Service, who were meeting in Auburn, Alabama . The Internet interaction allowed a lively discussion between Dale (from Oak Ridge) and the USDA project leaders about future demonstrations and analysis of bioenergy opportunities and impacts.
- Virginia Dale, Keith Kline, and Rebecca Efroymson presented “The Energy, Climate Change, Land-Use Nexus” to the U.S. Chapter of the International Association of Landscape Ecology, Snowbird, Utah, April 2009.
- Virginia Dale moderated a panel on Defining Sustainability: Science, Standards, and Scorecards at the Biomass 2009 meeting March 17 and 18, 2009, in Washington, DC.

## **Publications**

Kline KL , VH Dale, R Lee, and P. Leiby. 2009. In Defense of Biofuels, Done Right. *Issues in Science and Technology* 25(3): 75-84.

USDOE and USDA. 2009. *Sustainability of Biofuels: Future Research Opportunities: Report from the October 2008 Workshop*. DPE/SC-0114, U.S. Department of Energy Office of Science and U.S. Department of Agriculture  
(<http://genomicsgtl.energy.gov/biofuels/sustainability/> and <http://www.ree.usda.gov/>)  
[prepared with contributions from Pat Mulholland and Virginia Dale]

Dale VH. 2009. Power plants. *ISSE Indicator*. June issue.  
<http://isse.utk.edu/pdf/issepubs/newsletter/Spring09.pdf>

### **Papers in Review:**

Dale, VH, L Wright, KL Kline, R Perlack, RL Graham, M Downing. Interactions Between Bioenergy Feedstock Choices and Landscape Dynamics and Land Use. Submitted to *Ecological Applications*.

Kline KL, and MD Coleman,. Woody Energy Crops in the Southeastern United States: Two Centuries of Practitioner Experience. Submitted to *Biomass and Bioenergy*.

## **Proceedings**

CBES (Center for BioEnergy Sustainability, Oak Ridge National Laboratory). 2009. Land-Use Change and Bioenergy: Report from the 2009 workshop, ORNL/CBES-001, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy and Oak Ridge National Laboratory, Center for Bioenergy Sustainability  
(<http://www.ornl.gov/sci/besd/cbes.shtml>).

USDOE and USDA. 2009. Sustainability of Biofuels: Future Research Opportunities: Report from the October 2008 Workshop. DPE/SC-0114, U.S. Department of Energy Office of Science and U.S. Department of Agriculture  
(<http://genomicsgtl.energy.gov/biofuels/sustainability/> and <http://www.ree.usda.gov/>)  
[prepared with contributions from Pat Mulholland and Virginia Dale]

Dale, VH, KL Kline, PJ Mulholland, ME Downing, RL Graham, and LL Wright (2009) “Selecting Metrics for Sustainable Bioenergy Feedstocks” Proceedings of the Second Workshop. Beijing, October 15–17, 2008, China–United States Joint Research for Ecosystem and Environmental Change [Pages 49–53, published by the Institute for a Secure and Sustainable Environment, The University of Tennessee].

## **Factsheets**

All of the CBES factsheets appear on the Center's website.

- Agronomic Feedstock Production and Environmental Impact Analyses
- Bioenergy Knowledge Discovery Framework
- Biofuel Supply Chain Infrastructure
- Geospatial Science and Technology for Bioenergy
- Landscape Design for Bioenergy Cropping Options
- Land-Use Changes and Bioenergy
- ORNL Capabilities in Support of International Development
- Spatial Modeling of Geographic Patterns in Biodiversity and Biofuel Production

## **Posters**

Dale VH, Kline KL and Efroymsen RA. 2009. Land-Use Change and Bioenergy Workshop. Displayed at the workshop on Land-Use/Land-Cover Change and the Carbon Cycle, Ann Arbor, MI., June 8–9, 2009.

## **Noteworthy Information Exchanges**

- On September 23 and 24, Virginia Dale, Mark Downing, and others met with representatives from Mendel Biotech and discussed their draft “Feedstock Supply Proposal – Ten Million Ton Challenge.” Mendel Biotech was presented by Neal Gutterson, Karen Century, Aaron Shugart, and John Richardson. More information can be found at <http://www.mendelbio.com>
- Virginia Dale had several phone conversations with members of the JASON project at the National Geographic Society regarding the mission that she will lead in their newest module. Participants in these discussions have included Caleb Schultz (President of Jason), Suzy Tichenor (Director, Industrial Partnerships Program for ORNL), and Martin Keller (Director, BioEnergy Science Center). The mission being developed will cover natural disturbances, the ways that humans use the land (e.g., growing bioenergy feedstocks), and people's effects on the environment. Virginia briefed Thomas Zacharia on this mission, as well.
- Debo Oladosu presented information on Land-Use Impacts of U.S. Corn Ethanol: Reconciling Models, Empirical Data, and Policy. National Corn Growers Association meeting, Aug 25th & 26th in S. Louis, MO. meeting on "Land Use: Carbon Impacts of Corn Based Ethanol 2009.

- At the NCASI meeting on June 25, Virginia Dale talked with Douglas Hermann (douglas.hermann@aecom.com) about work that AECOM is performing on geologic sequestration of carbon via biochar.
- Virginia Dale discussed ideas for collaboration on bioenergy sustainability with members the National Council for Air and Stream Improvement (NCASI) on June 24. NCASI is an independent, non-profit research institute that focuses on environmental topics of interest to the forest products industry. The major NCASI members involved in this discussion were Al Lucier, Paul Van Deusen, and Larry Irwin. The idea was proposed to have a workshop in the winter of 2009–2010, during which information on existing watershed studies could be shared. The watersheds to be discussed are those for which background water, biodiversity, and soil data already exist so that these places might be adopted for analyzing effects of biomass plantings on environmental sustainability. Future collaborative efforts will then focus on experiments to assess bioenergy impacts via a paired watershed design.
- Keith Kline and Debo Oladosu met with Tim Persons, Chief Scientist for the GAO, and discussed issues related to the Renewable Fuel Standard program’s greenhouse-gas rules and the land-use-change estimates. Presentation: “ORNL Research on Bioenergy Impacts on Land – Sustainability and Land-Use change Modeling,” Oak Ridge, June 18, 2009.
- Virginia Dale had a good discussion with Roger Dahlman of DOE during the workshop on Land Use/Land Cover Change and the Carbon Cycle, Ann Arbor, MI., June 8-9, 2009. The topic discussed was opportunities for the Office of Science to invest in work related to scaling issues, which are critical to resolve to understand bioenergy impacts on sustainability.
- On May 27, Keith Kline and Virginia Dale discussed bioenergy sustainability with Susanne Moser (<http://www.isse.ucar.edu/moser/cv.html>), who is a geographer by training with a diverse background in issues that surround climate change, adaptation, science-policy interactions, decision support, and various aspects of human dimensions.
- On May 27 Virginia Dale briefed Commander E. J. McClure, USN, Office of the Secretary of Defense, about ORNL’s diverse interests and expertise in climate change, bioenergy, and land use.

## **General Outreach**

- The website for the Center for BioEnergy Sustainability (<http://www.ornl.gov/sci/besd/cbes/>) provides access to activities and resources for CBES and is maintained on a real-time basis. The website contains information and links on:

**CBES Overview**

**News**

**Upcoming Events**

**ORNL Workshops**

**CBES Forums**

**Opening Ceremony**

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

**Brochure**

**Factsheets**

**Activities initiated to engage others**

**Stakeholder Registration**

**Stakeholder Database**

**Related Activities**