

**Bioenergy Sustainability and Land-Use Change Report
Oak Ridge National Laboratory (ORNL)
May 2011**

Award:

The Jason Project won the Best Science or Health Curriculum category at the CODiEs for *Operation: Tectonic Fury* to which ORNL staff contributed. Awarded by Software and Information Industry Association, this is a highly competitive and prestigious award for online educational publishers, game developers and software programmers. The judges for the education categories come from industry, schools, colleges and universities and looked at all of the online content including the text, photos, technical art, games, videos, and teacher resources like tests and classroom handouts of *Tectonic Fury*. This project was suggested by Martin Keller and led by Virginia Dale with expert advice provided by Esther Parish. Amy Johnson and Sam Jackson from the University of Tennessee helped engage the middle school students and teacher in sampling soils under switchgrass in fields near Vonore, Tennessee. The soils were analyzed under the guidance of Deanne Brice and Charles Garten. Mike Hilliard and Alex Sorokine shared model results about the sustainability implications of energy crops via the Everest display. Bobby Whitten showed the students how ORNL's supercomputers are used to expand knowledge. The module *Operation: Tectonic Fury* provides a way for middle school students to use basic science skills to understand how geologic and human forces shape the earth. Because of ORNL's contributions, farming practices and planting of energy crops are included as influences. The true reward, of course, is knowing that this excellent teaching module will help science come alive in middle schools across the country for many years to come.

ORNL Publications:

Dale, V.H. 2011. The role of disturbance in seasonally dry tropical forest landscapes. Pages 75-97 In W. McShea, J. S. Davies, N. Bhumpakphan (Editors) *The Ecology and Conservation of Seasonally Dry Forests in Asia*. Washington, DC: Smithsonian Institution Scholarly Press.

ORNL Presentations:

May 2-5: ORNL participated in 33rd Symposium on "Biotechnology for Fuels and Chemicals," Seattle, WA. Robin Graham gave a presentation titled "Indicators to Support Environmental Sustainability of Bioenergy Systems" that was developed by Virginia H. Dale, Allen C. McBride, Latha M. Baskaran, Mark E. Downing, Laurence M. Eaton, Rebecca A. Efrogmson, Charles T. Garten Jr., Keith L. Kline, Henriette I. Jager, Patrick J. Mulholland, Esther S. Parish, Peter E. Schweizer, and John M. Storey.

May 17-18: Latha Baskaran attended the Frontiers in Bioenergy conference at Purdue University and gave a presentation on "Evaluating bioenergy sustainability using indicators and a watershed-scale optimization model."

May 24: Keith Kline presented "Bioenergy, Land-Use Change and Food Security" underscoring the opportunities for bioenergy to address multiple development goals in a webinar sponsored by the National Biodiesel Board (www.biodieselsustainability.org). Over one hundred people and

classrooms registered for the webinar which targeted graduate students and “Next Generation Scientists.” The webinar received print and radio coverage.

ORNL Provided Comments:

Debo Oladosu and Keith Kline provided comments to DOE Office of the Biomass Program on the economic indicators proposed by the Global Bioenergy Partnership (GBEP). ORNL recommendations addressed indicators for "Change in Income," "Gross Value Added" and "Net Economic Contribution." ORNL also suggested several alternatives to a proposed sub-indicator on income distribution.

ORNL staff reviewed manuscripts regarding bioenergy that were submitted to the journals *Environmental Letters*, *Ecological Economics*, and *Biological Conservation*.

ORNL also contributed to the revision of the draft “Vision and Action Plan” document for the Global Sustainable Bioenergy Project (GSB) Stage 2.

ORNL CBES Forum:

A special Center for Bioenergy Sustainability Forum was held on May 12th, 2011. The guest speaker was Luis A.B. Cortez, of University of Campinas, Brazil. Luis featured a special presentation on potential for bioenergy expansion in Latin America and Africa (the LACAF Project).

The Center for Bioenergy Sustainability Forum was held on May 19th, 2011. The guest speaker was Ken Goddard who is UT’s Extension Biofuels Specialist. Ken presented “Growing and Harvesting Switchgrass for Ethanol Production in Tennessee” as his topic for discussion. (See http://www.ornl.gov/sci/ees/cbes/forums/Slides_.pdf)

Other Activities:

May 2: Maggie Stevens began a 6-month HERE assignment supported by the DOE Office of Biomass Program (OBP) Brazil Project, working with Keith Kline, Debo Oladosu and others to analyze sustainable bioenergy production and land use change. Maggie is a graduating Masters student from UT's department of Forestry Wildlife and Fisheries Science and recently returned from Minas Gerais, Brazil, where she examined land use and eucalyptus farming near a reserve in the Atlantic Forest of Brazil.

May 2: Esther Parish of ESD judged the Dyllis Elementary School Science Fair alongside Ken Tobin, Director for the Measurement Science and Systems Engineering Division (MSSED), and Shaun Gleason, Leader of the MSSED Imaging, Signals and Machine Learning Group. Approximately 30 fourth-graders and 1 third-grader participated in this second annual event organized by fourth grade science teacher, Mrs. Annette Tullock. The top three projects were related to biology and physics.

May 10: Scott Curran, Keith Kline and Virginia Dale met with Richard Venditti and Rolands Gonzalez from the Department of Forest Biomaterials at North Carolina State University and discussed how they can work together to address Life Cycle Analysis of biofuels.

May 11: Virginia Dale and Mark Downing attended the Core University Bioenergy workshop held at ORNL. Approximately 25 faculty from the core universities and 10 staff from ORNL

participated. The purpose of this workshop was to share information on ORNL and university bioenergy research activities, priorities, and future plans. The desired outcome is to identify areas of common interest leading to collaborative research and proposal opportunities.

May 11-20: Esther Parish completed a mini-term course in modeling methods through a University of Tennessee taught by visiting ecology professor Marko Debeljak of the Josef Stefan Institute in Slovenia. She acquired new skills that have the potential to benefit future projects related to bioenergy sustainability and climate change, including:

- 1) Machine learning/data mining techniques to create classification trees, regression trees and predictive modeling trees (using Weka software)
- 2) Compartment modeling with STELLA dynamic ecological modeling software to track flows of matter/energy through a system over time
- 3) Melding of “soft science” and physical parameters to construct a Multi-attribute Decision Support System model.

May 12-13: Luis Cortez, University of Campinas (Brazil) faculty, Special Projects Coordinator at the Foundation for Research of Sao Paulo (FAPESP - <http://www.fapesp.br/en/>), and member of the Executive Committee for the Global Sustainable Bioenergy Project (GSB), visited ORNL to discuss prospective collaborations and synergies between Brazil and ORNL researchers. One outcome was a plan to submit a joint-proposal for matching funds to support collaborative research on sustainable bioenergy production and land use change.

May 13: Keith Kline, Allen McBride and Virginia Dale participated in a conference call with colleagues from Canada regarding bioenergy sustainability and how to measure it. Canadian participants included Brian Titus, Barbara Kishchuk, Derek Sidders, Lawrence Townley-Smith, Mark Stumborg, David Paré, Evelyne Thiffault, and Jeff Karau. The call was the second in an ongoing series designed to foster communications and collaboration.

May 16-20: Keith Kline served as an official US delegate for the International Organization for Standardization (ISO) Project Committee working sessions on "Sustainable criteria for bioenergy" in Frankfurt, Germany, and facilitated negotiations to approve resolutions clarifying that this will be a Process Standard and that the issue of indirect effects will be examined by Work Group 4, led by Argentina, Canada with the U.S. ORNL also contributed to the complete revision of the draft Standard for GHG emission calculations and prepared a work plan with mandate, scope and criteria for WG4.

May 17-18: Virginia Dale attended the Great Lakes Bioenergy Research Center (GLBRC) Sustainability Retreat and Modeling Workshop in South Bend, Indiana.

May 4-31: Keith Kline and Maggie Stevens, at the request of Alison Goss Eng, developed and submitted talking points and overview slides to be used in future OBP presentations. The materials highlight international collaborations on bioenergy including those involving the ISO, Brazil, IEA, GPEP and IPCC.

Upcoming ORNL Visits/Events:

June 1st – Virginia Dale will give a presentation to 500 5th-8th grade students and teachers at the Glenville State College, WV on behalf of The Jason Project. <http://www.jason.org/>

June 14 – Virginia Dale will speak to the National Research Council meeting on Sustainable Algal Biofuels in a panel on Environmental Effects of Large-Scale Algal Biofuels Production in Washington, DC.

July 25-27 – Keith Kline is requested to present on international bioenergy collaborations for the DOE sponsored event, Biomass 2011 (Washington D.C.)

September 19-21 – ORNL representative will present at the IEA Joint Task 38/40/43 Workshop on "Quantifying and managing land use impacts of bioenergy" in Campinas, Brazil.

October 18-19 – Keith Kline is invited to speak at The Coordinating Research Council(CRC- This non-profit organization directs engineering and environmental studies on the interaction between automotive industry and petroleum products (two current projects relate to biofuels)) Lifecycle Analysis Workshop in the "Land Use Change and GHG Emissions" session (at Argonne National Laboratory).

November 2011: Virginia Dale will visit Michigan Technological University as a Distinguished Ecologist lecturer in the School of Forest Resources and Environmental Science.

November 13-16: Mike Hilliard will give a presentation at the Annual Meeting of the Institute for Management Science and Operations Research (INFORMS) in Charlotte, NC, on the Biomass Location for Optimal Sustainability Model (BLOSM) --Balancing Profit and Water Quality in a Watershed. His presentation will use data from the watershed surrounding a cellulosic ethanol refinery in Tennessee, an optimization model paired with results from a water quality model demonstrates that planting switchgrass in the right locations can improve nitrogen, phosphorus and sediment levels with a moderate impact on revenue. A web-based interface communicates the results. <http://meetings2.informs.org/charlotte2011/index.html>