

**Bioenergy Sustainability and Land-Use Change Report
Oak Ridge National Laboratory
October 2010**

Invited Talks and Presentations:

October 17-20: Keith Kline gave a presentation on the Global Sustainable Bioenergy Project at Open Science Meeting of the Global Land Project (GLP) in Tempe, AZ. GLP is a special project under the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP). Keith participated in several side-meetings including:

- potential cooperation and synergy on initiatives to address gaps in land-use change modeling for bioenergy (reference data sets, platform comparing models) to be coordinated by the Earth System Science Partnership (ESSP) – an umbrella group linking the four global environmental change programs [IHDP, IGBP, the World Climate Research Programme (WCRP), and DIVERSITAS, an International Programme of Biodiversity Science];
- discussions of potential synergy with a new Consultative Group on International Agricultural Research (CGIAR) Climate Change Agriculture Food Security Challenge Consortium Research Program (CCAFS-CRP).

Nagendra Singh and Esther Parish also attended the GLP meeting, and Esther participated in a workshop on land modeling associated with the meeting.

October 17-19: The 8th Biennial Short Rotation Woody Crops (SRWC) Operations Working Group Conference was held in Syracuse, New York. Presentations given by Oak Ridge National Laboratory (ORNL) include: “Preview of the Billion-Ton Annual Supply Assessment” and “Challenges to mapping yields and modeling production of woody crops” by Laurence Eaton, “SRWC published and reported yields in US poplars, willows & pines” by Lynn Wright, and “Yield, profitability, and optimum harvest scheduling of *Eucalyptus* spp. in Florida” by Matt Langholtz. Mark Downing moderated the Social/Economic Dimensions session.

The monthly Center for BioEnergy Sustainability (CBES) Forum was held on October 21, 2010. The topic of the forum was "Bioenergy Sustainability Standards, Certification and Regulations." The speakers were Sam Jackson of the Tennessee Agricultural Experiment Station in the Forest Products Center at The University of Tennessee and Virginia Dale, Director of CBES.

October 27-28: Virginia Dale gave a presentation to the National Academies' Roundtable on Science and Technology for Sustainability in Washington, D.C.

October 31-November 3: Mark Downing and Michael Casler (Agricultural Research Service [ARS] Research Geneticist, Madison, Wisconsin) organized a symposium, “Biomass Energy Systems: Research Needs to Address Policy Issues,” at the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA-ASSA-CSSA) Joint Convention in Long Beach, CA. <https://www.acsmeetings.org/> Presentations Included:

- *Are Our Research Needs Driving Policy? or Is Policy Driving Our Research?* given by Mark Downing.
- *Bioenergy Research and Strategic Planning: The Need for Both Proactive and Reactive Research* given by Robert Mitchell, USDA-ARS; Kenneth Vogel, USDA-ARS.

- *The Tyranny of Big Ideas in Environmental Policy* given by Alan Lucier, National Council for Air and Stream Improvement (NCASI).
- *TNC Perspective* given by Jimmie Powell, The Nature Conservancy (TNC).

Interviews:

October 1: Keith Kline was interviewed by Maggie Koerth-Baker, a science journalist working on a book about the future of energy in the United States for Wiley & Sons publishers.

Meetings attended:

October 5-8: Robin Graham attended the Office of Biomass Quarterly Review in Washington D.C.

October 7-8: Virginia Dale participated in the meeting of the National Academy of Sciences Committee on Economic and Environmental Impacts of Increasing Biofuel Production in Irvine, California.

October 12-14: Virginia Dale participated in the meeting of the Council on Sustainable Biomass Production (CSBP) in Kansas City, MO, and attended the field trip to Show Me Energy <http://www.goshowmeenergy.com/>. Dale, Kline and Langholtz also participated in CSBP Task Force conference calls to discuss progress and issues in preparation for the meeting.

October 14-15: ORNL contributed to several presentations during a review of preliminary recommendations for the California Air Resources Board on improving regulations related to land-use change under the Low-Carbon Fuel Standard. The Expert Work Group reviewed progress to date in nine sub-groups. The principle presentation from ORNL was titled, "Decomposition Analysis of U.S. Corn Use for Ethanol Production from 2001-2008." Contributions were also made for presentations related to time accounting, land availability, effects of other fuels, food-fuel interactions and emission factors. See <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>.

October 21: Keith Kline and Debo Oladosu met with Alison Goss Eng and Zia Haq at the Department of Energy (DOE) in Washington, D.C., to review progress and discuss plans for research on Global Feedstock Supply, Modeling and Land Use.

October 29: Virginia Dale met with Alison Goss Eng in Washington, D.C., to discuss ORNL's research on Bioenergy Sustainability.

Reviews:

Comments were provided to Alison Goss Eng from Rebecca Efrogmson, Keith Kline, and Virginia Dale on the International Energy Agency (IEA) report on Land Use Change Mitigation.

Comments were provided to the Roundtable on Sustainable Biofuel (RSB) on version 1.1 of *RSB Principles and Criteria* and *RSB Guidance on Principles & Criteria* by Allen McBride, Rebecca Efrogmson, and Keith Kline.

Center for BioEnergy Sustainability												
Web Statistics Report												
	2009			2010								
Site	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Monthly & Annual Report		61	109	84	99	92	252	185	201	135	136	107
Symposia						83	777	442	399	637	213	249
Factsheets	200	220	252	180	280	227	872	511	502	391	266	377
Forums	515	496	565	578	723	773	2,144	1,312	1,556	1,127	731	1,022
Images	2,141	1,706	2,412	2,839	2,306	2,224	2,423	2,101	1,504	1,241	794	885
Workshops												
Land-Use	414	299	280	1,171	1,390	1,007	2,228	1,315	1,432	1,004	541	700
EPA	191	199	239	136	171	183	316	196	211	143	105	125
Watershed	89	125	197	151	85	111	207	324	161	121	84	89

Manuscripts Submitted for Review:

Bielicki JM, Das S, Davison B, Kremer F, Leiby P, Miller A, Oladosu G, Nukala S, Perla D, Peterson S, Pillai R, and Uria-Marinez R. In review. Comparative analysis of bioenergy pathways. *Environmental Management*.

Abstract

“Sustainability” encompasses long-term economic viability, environmental integrity, and social acceptability. Assessments of the sustainability of options for bioenergy must thoroughly evaluate multivariate systems and components. A number of conversion processes can produce and extract bioenergy from many biotic feedstocks, and some of the multiple products and co-products can be used as intermediate inputs, or feedstocks, in further conversion processes. There are many routes—pathways—that carbon molecules can take from being bound in the biotic tissue or mass of the biota through the processes that convert these feedstocks into the products that society uses (e.g., heat, electricity, transportation fuel), and the co-products it could. We present a comparative analysis of bioenergy pathways, and provide a framework for comprehensively evaluating the sustainability of these systems and their components. We diagram the pathways and present two aspects of sustainability—the flexible use of co-products and the efficient use of water resources given the demands within and across the pathways and conversion processes—especially for corn and corn stover, switchgrass, and algae, and we present implications for integrated biorefineries. Our comparative analysis provides a collective basis for identifying inflection points within the pathways where choices that are made can preserve or prohibit downstream options.

Dale VH, Efroymsen RA and Kline KA. In review. The land use – climate change – energy nexus. *Landscape Ecology*.

Abstract

Landscape ecology focuses on the spatial patterns and processes of ecological and human interactions. These patterns and processes are being altered by both the changing resource-management practices of humans and the changing climate conditions associated, in part, with increases in atmospheric concentrations of greenhouse gases. Dominant resource-extraction and land-management activities involve energy, and the use of fossil energy is one of the key drivers behind increasing greenhouse gas emissions as well as land-use changes. Alternative energy

sources (such as wind, solar, nuclear, and bioenergy) are being explored to reduce greenhouse gas emission rates. Yet, energy production, including alternative-energy options, can have a wide range of effects on land productivity, surface cover, albedo, and other factors that affect carbon, water and energy fluxes, and, in turn, climate. Meanwhile, climate influences the potential output, relative efficiencies, and sustainability of alternative energy sources. Thus, climate change, energy choices, and land-use change are linked, and any analysis in landscape ecology that considers one of these factors should consider them all. This analysis explores the implications of those linkages and points out ecological patterns and processes that may be affected by these interactions.

Johnson T, Bielicki J, Dodder R, Hilliard M, Kaplan P, and Miller C. In review. Barriers to sustainable bioenergy: Stakeholder interests and the evolving issue domain. *Environmental Management*.

Abstract

Sustainable bioenergy production depends on the resolution of both scientific and nontechnical barriers to its development. We focus on the need to recognize and manage stakeholder diversity as an example of the latter. As a complex issue domain, bioenergy involves a disparate set of direct and indirect stakeholder groups, who have unique interests and use different criteria in evaluating the usefulness of information and making decisions. As a dynamic issue domain, new concerns continue to enter the bioenergy sustainability debate, and bring with them additional stakeholders. We draw on the scientific assessment and common-pool resource literature (e.g., Clark and others 2002, Ostrom 1990) to discuss the implications of this evolving diversity for those concerned with furthering sustainable bioenergy production. First, researchers and others wishing to intervene in bioenergy development need to understand the factors affecting stakeholder receptivity to information—the attributes different stakeholder groups look for in their information resources—if knowledge is to reach its widest potential use and lead to tangible outcomes. Second, efforts to promote sustainable bioenergy must focus on the development of processes to manage competing stakeholder interests, without which we risk both fragmented and conflicting decision making, and therefore potentially unsustainable impacts on a larger scale. Our intent is to raise awareness of these issues, and point to the need for an expanded social science perspective that complements efforts to develop improved technologies and reduce scientific uncertainty.

McBride AC, Dale VH, Baskaran LM, Downing ME, Eaton LM, Efroymson RA, Garten Jr. CT, Kline KL, Jager HI, Mulholland PJ, Parish ES, Schweizer PE, and Storey JM. In review. Indicators to support environmental sustainability of bioenergy systems. *Ecological Indicators*.

Abstract

Indicators are needed to assess environmental sustainability of bioenergy systems. Effective indicators will help in the quantification of benefits and costs of bioenergy options and resource uses. We identify specific measurable indicators for soil quality, water quality and quantity, greenhouse gases, biodiversity, air quality, and productivity, building on existing knowledge and on national and international programs that are seeking ways to assess sustainable bioenergy. This suite of indicators is hypothesized to reflect major environmental effects of diverse feedstocks, management practices, and post-production processes. The importance of each indicator is identified. Future research relating to this indicator suite is discussed, including field testing, target establishment, and application to particular bioenergy systems.