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Overview of the Center for Advanced BioEnergy Research at the University of Illinois, Urbana–Champaign

Hans P. Blaschek[†,‡,*], Greg Knott[†,‡], Jurgen Scheffran[†,¶], Ted Funk[†,§], and Sue Overmyer[†]

[†]CABER (Center for Advanced BioEnergy Research), [‡]Department of Food Science and Human Nutrition, [§]Department of Agricultural and Biological Engineering, University of Illinois at Urbana–Champaign, Urbana, Illinois 61801, and [¶]Departments of Political Science and Atmospheric Sciences and the Program in Arms Control, Disarmament and International Security, University of Illinois at Urbana–Champaign, Champaign, IL 61820

The Center for Advanced BioEnergy Research (CABER, bioenergy.uiuc.edu) was formed ~1 year ago in response to the 2006 University of Illinois Strategic Plan, which called for the university to take the lead in the state of Illinois in the area of sustainable energy production and consumption. The strategic plan also called for formation of an initiative that brings together scientists from different institutions in Illinois to work together in order to solve multidiscipline-based problems in sustainable energy. In response to this call, a symposium entitled "Sustainable Bioenergy: Focus on the Future of Biofuels and Chemicals" was held in April 2006 at the Urbana campus. This meeting brought together scientists from industry, academia, and government, including the University of Illinois, Urbana–Champaign (UIUC), the Argonne National Laboratory, and the U.S. Department of Agriculture laboratory in Peoria. These interactions ultimately led to the expansion of the group to include Northwestern University and the University of Chicago and the submission of a multi-institutional grant to the U.S. Department of Energy.

The purpose of CABER is to provide a facilitative structure for campus outreach, teaching, and research in areas related to bioenergy systems, to provide a platform for promoting national and international visibility of faculty, and to enhance opportunities for obtaining external support. Although the administrative offices of CABER are physically located in the College of Agricultural, Consumer and Environmental Sciences (ACES), CABER is expected to serve as a campus-wide resource. CABER will focus on developing cross-disciplinary research, education, and outreach capacity in order to overcome bottlenecks associated with the economical use of biorenewable resources. This mission is consistent with the university's land grant mission and the national vision for crop-based renewable resources in the 21st century. Ultimately, CABER is expected to provide enhanced visibility to the University of Illinois in the bioenergy arena, facilitate collaborative relationships, and

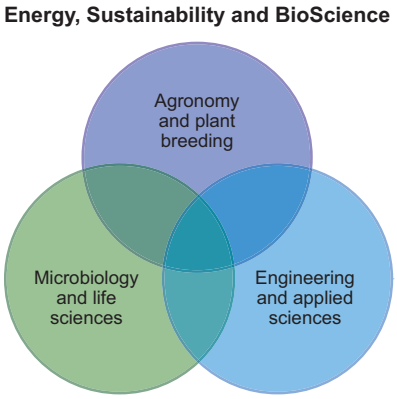

Figure 1. CABER: Intersection of Expertise

***Corresponding author, blaschek@uiuc.edu.**

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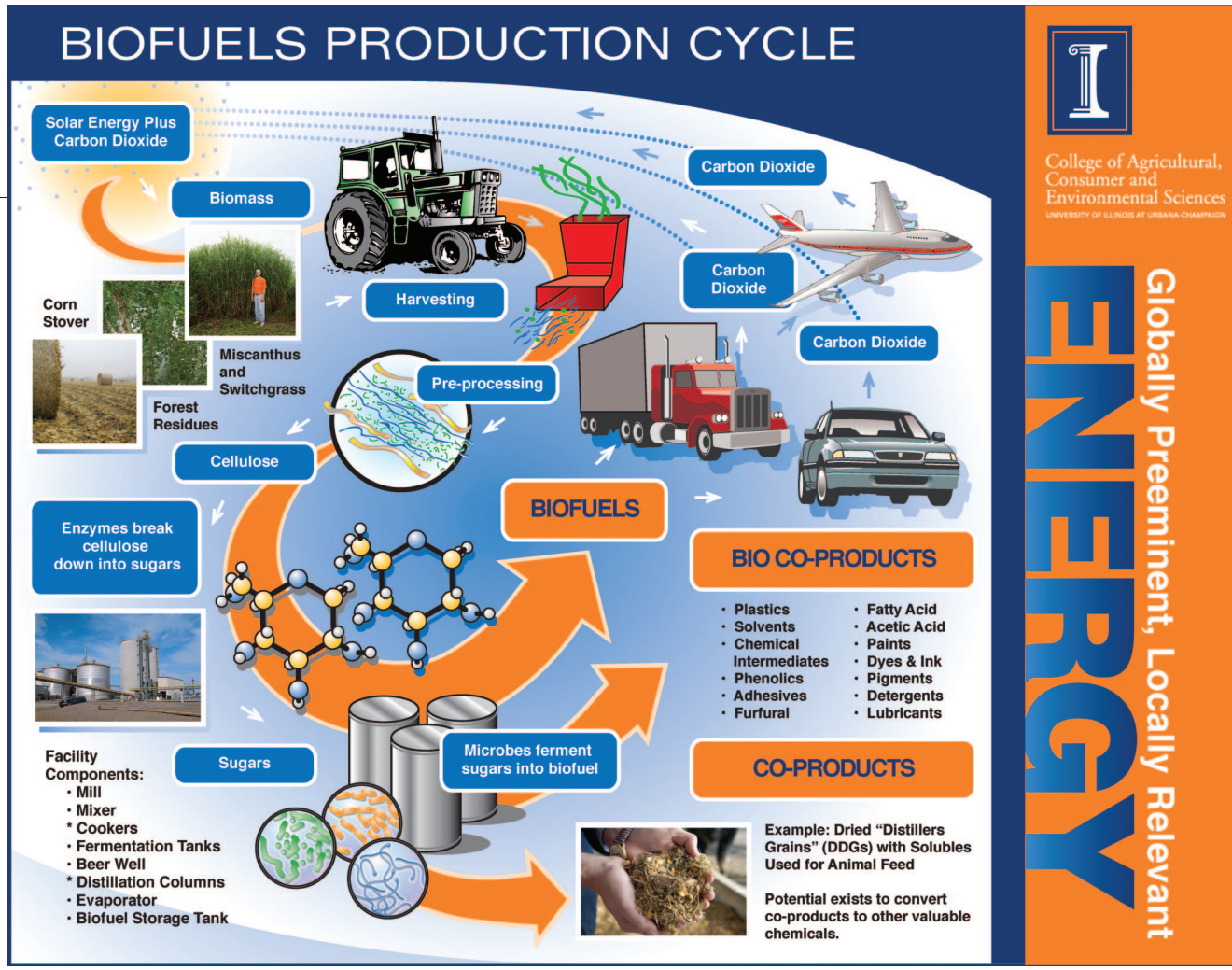

Figure 2. Steps in the bioenergy value chain.

help shape national energy policy, leading to improved funding opportunities.

CABER surveyed faculty interests on the UIUC campus and discovered that >120 faculty have research interests or activities focused on some aspect of bioenergy systems, including development of new energy crops, grain and coproduct processing, harvesting logistics, cell wall deconstruction and fermentation, energy markets, energy policy and modeling and life cycle analysis, and social impacts on rural development (http://bioenergy.uiuc.edu/collaborators.pdf). Some specific examples of biorenewables activities at UIUC include research on *Miscanthus* as a dedicated energy crop, examination of tropical maize as a near-term solution to the production of biofuels, conversion of corn fiber in distillers' grains to biofuels such as ethanol and butanol, swine waste conversion, ethanol-diesel, and biologically based fuel cell research.

CABER is envisioned at the intersection of expertise as it relates to energy, sustainability, and bioscience (Figure 1). Its role has been to help bring together investigators in disciplinary areas representing agronomy and plant breeding, microbiology and life sciences, and engineering and applied sciences. One such intersection is reflected in CABER's connections with the Institute for Genomic Biology (IGB). Thematic efforts within IGB include the biomass conversion theme (www.igb.uiuc.edu/research/biomass.html), which is made up of investigators who are able to address the entire bioenergy value chain, from plant modification using the new tools of biology all the way to fermentation and downstream processing.

More recently, UIUC established a partnership with the University of California at Berkeley and the Lawrence Berkeley National Laboratory that resulted in a 10-year contract with BP to form the Energy Biosciences Institute (EBI). The EBI represents one of the largest privately funded academic–industrial initiatives. It is anticipated that CABER will help facilitate future interactions that lead to these types of university–industry partnerships.

Current CABER-sponsored activities include promoting multidisciplinary bioenergy-related research between UIUC and the University of Sao Paulo, Brazil; the establishment of an M.S. professional science degree program in bioenergy; and the development of a UIUC bioenergy seminar series for spring 2008. CABER has also been working with the UIUC College of Engineering to develop a graduate option in energy and sustainability; a regional activity called the Illinois Energy Systems Initiative, which involves partner institutions in Illinois; and an upcoming campus-wide energy and sustainability summit scheduled for April 2008.

Recently, a state-funded appropriation of $3.2 million has allowed for the planning of the Integrated Bioprocessing Research Laboratory. This flexible, translational, scale-up facility will focus on the chemical, physical, and biological conversion of renewable feedstocks to biofuels and other value-added products. Pilot-scale operations are expected to include capabilities in fractionation, separations, recovery, processing, and fermentation. Multistage processes will be used to convert lignocellulosic crops as well as coproducts to liquid fuels and chemical feedstocks. This facility will house the CABER offices and bring together faculty and industry partners in an environment that will be conducive for commercialization of value-added products and processes.

The expertise of the staff at CABER includes Director Hans Blaschek, who is a Professor of Food Microbiology and Assistant Dean in ACES. His areas of interest include genomics of biobutanol-producing *Clostridium beijerinckii* and bioprocessing. Associate Director Gregory Knott specializes in facilitating campus bioenergy-related activities. Jürgen Scheffran, the Assistant Director of Education for CABER, is an Adjunct Professor in the Departments of Political Science and of Atmospheric Sciences and a Senior Research Scientist in the Program in Arms Control, Disarmament and International Security. He is actively involved in research on climate change, renewable energy, and the economics of biofuels. Ted Funk is the Assistant Director for Extension and Outreach for CABER and is an Assistant Professor in Agricultural and Biological Engineering and an Extension Specialist. His areas of interest include manure management and conversion.

Although CABER may not be the first university center focused on biorenewables, given the extensive expertise of UIUC faculty and our regional partners, it certainly has a bright future. Alleviating the potential bottlenecks in areas throughout the bioenergy value chain, from sunlight to biofuels and chemicals (Figure 2), will require many scientists, engineers, and economists working together in a multidisciplinary approach in order to be successful. Having an administrative structure in place that helps to facilitate these interactions is what CABER is all about.