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## Book Review: Agriculture as a Producer and Consumer of Energy

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## BOOK REVIEWS

**Agriculture as a Producer and Consumer of Energy.** Edited by J.L. OUTLAW, K.J. COLLINS, and J.A. DUFFIELD. CAB International, Wallingford, Oxfordshire, OX108DE, UK. 2005. Hardcover, 345 pp., \$120.00. ISBN 0-85199-018-5.

As the title of this book suggests, agriculture resides on both sides of the nation's energy balance equation. Throughout history, agriculture has used and produced energy. Early agriculture relied on human and animal traction; much of the produce was consumed to power the enterprise. From the end of World War II through the present, a unique period in agricultural production has existed. Energy used on farms has come from sources beyond the farm gate—oil wells in the Middle East and Alaska's North Slope, coal mines in Wyoming, and natural gas fields in Gulf States and the Gulf of Mexico. As world energy reserves diminish and environmental concerns about global warming increase with each calorie of fossil fuel consumed, agriculture is again being challenged to become a producer of renewable domestic energy to offset supply disruption and stabilize fuel prices—both risks strongly influenced by international politics and turmoil.

Chapters in this book are based on talks addressing the potential of agriculture to influence the nation's production and consumption of energy presented at a conference by the same title. The conference, sponsored by the Farm Foundation and the USDA's Office of Energy Policy and New Uses, was held in Arlington, VA, 24–25 June 2004. A rather extensive website, <http://www.farmfoundation.org/projects/03-35agasenergyproducerandconsumer.htm>; verified 22 March 2006, gives access to introductory remarks from then Secretary of Agriculture Ann Veneman (not in the book), visuals used during the conference talks, a summary of the conference, and an online order form for the book.

The goals of the conference, and the book, were (i) to provide current information, data, and ideas on energy use in agriculture and agriculture's capacity to produce fuel and fuel feedstock; (ii) to compile and generate background information for industry, researchers, policy makers, and public and private organizations to use in assessing and administering energy programs; and (iii) to encourage interaction and exchange among federal and state agencies, private companies, academics, and nonprofit organizations.

The book was written by knowledgeable scientists, economists, and engineers, and therefore is technical in approach and content. The target audience is those deeply involved in energy production, use, and sustainability. Fortunately, the authors blend appropriate background information into their text to assist newcomers to the fields of agricultural energy use and bioenergy production in understanding the issues. This point is especially important in discussions of production of biofuels and bio-based products. The book is a timely summary of current thinking and the state of science and policy regarding energy in agriculture, as of mid-2004. As a volume based on current technology and concepts, it may not age gracefully. The field of bio- and renewable energy is advancing rapidly. New ideas are being developed and tested daily that may challenge summary and concluding statements made in this book.

The book contains four exceptional commissioned chapters and an equally outstanding introductory chapter. These five papers served as the centerpieces for the conference. A series of 15 additional chapters discuss a broad range of topics relating to agricultural energy use, conservation, and production. The latter group of chapters varies more in quality and depth of coverage than the first five chapters.

Chapter 1 is an overview of the current energy situation with emphasis on federal farm and energy policy and how they have been sculpted by world food, feed, and fuel supplies and demands. Chapter 2 outlines agriculture's current capability and future potential to address the US demand for a stable domestic supply of renewable fuels. The discussion includes all types of fossil and renewable energy. Agriculture's consumption of energy is discussed in Chapter 3 with an explanation of why consumption and price change with time and location. Chapter 4 discusses challenges and opportunities for integrating biomass fuels into the existing energy infrastructure. The need for energy—in the right form, at the right place, and at the right time—to be useful underpins the discussion. The author of this chapter offers more thinking points than conclusions. The last of the commissioned chapters, Chapter 5, is short and describes interactions of current energy costs and prices with implications for future interactions with renewable sources. The next seven chapters (6–12) deal with economics of producing motor fuels from crops; ethanol from both grain and biomass, and biodiesel. The processes leading from the raw crop to ethanol or biodiesel are discussed and diagrammed extensively. Chapters 13 and 14 deviate substantially from the preceding chapters, discussing use of wind and solar energy for livestock watering and conservation of energy in poultry housing, respectively. The remaining chapters present ideas on new methods and technologies relevant to production of fuel from agricultural products or by-products. Topics include co-firing boilers with coal and switchgrass or animal manures to generate electricity, development of genetically enhanced organisms to improve conversion of biomass to ethanol, discussion of biofuel potential to reduce greenhouse gas emissions, and a discussion, from a life cycle analysis perspective, of the environmental impact of using corn (both grain and stover) to produce ethanol or an "environmentally friendly" polymer (plastic) precursor, polyhydroxyalkanoates (PHA), which is now derived from petroleum.

As stated previously, chapters are written largely by economists and engineers. Crop production practices and the potential for agronomists and crop scientists to influence either agriculture's energy use or energy production capacity are scarcely mentioned. Although agronomists and crop scientists are developing technology and have potential for further advancements that will dramatically change agriculture's energy consumption and production characteristics, crop and soil sciences are only addressed in passing as explanations for energy use patterns. Concerns about removing vast amounts of crop residue are addressed from the erosion standpoint. Concerns about further reducing soil organic carbon levels are mentioned, but sadly not highlighted, nor sufficiently explained, in the context of developing sustainable production practices for bioenergy feedstock.

An interesting observation is that although the book summarizes a conference on U.S. agricultural energy use and production, was written almost exclusively by authors from the USA, was funded by USDA and a US non-profit organization, and was meant for a US audience, it was published in the UK. As a result, traditional British spellings and terms are used throughout the volume. Readers will have to tolerate use of petrol for gasoline, tyre for tire, and programme for program, "amongst" others. Most quantities in the book are given in English units (feet, acres, gallons, pounds, etc.), but a few metric measures are reported. In summary, this should be a

book useful to individuals currently involved with specific facets of biomass energy or bio-based product production who want greater knowledge of the broader situation. The majority of the chapters are written to be understood by a wide range of readers. Background is offered in the text to bring newcomers to the area along; citations are extensive, allowing the curious to more deeply explore specific topics.

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