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Biofuels, Bioenergy, and Bioproducts from Sustainable Agricultural and Forest Crops

Proceedings of the Short Rotation Crops International Conference

Bloomington, Minnesota, USA
August 19-21, 2008

The findings and conclusions of each article in this publication are those of the individual author(s) and do not necessarily represent the views of the U.S. Department of Agriculture or the Forest Service. All articles were received in digital format and were edited for uniform type and style. Each author is responsible for the accuracy and content of his or her paper.

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Cover Photos

Front cover, clockwise from top left:

Poplar biomass crops in Quebec, Canada with pulp and paper processing facility in the background. Photo by Ron Zalesny, U.S. Forest Service.

Each round switchgrass bale in eastern Nebraska will yield about 50 gallons of ethanol. Photo by Rob Mitchell, USDA Agricultural Research Service.

Harvesting 3-year-old willow biomass crops in central New York using a Case New Holland forage harvester and a specially designed willow cutting head. Photo used with permission, Tim Volk, State University of New York.

Harvesting 4 tons of switchgrass per acre in late July in Nebraska. Photo by Rob Mitchell, USDA Agricultural Research Service.

Back cover:

Harvesting 6- to 7-year-old poplar biomass crops in the Pacific Northwest (estimated yield of 5 to 6 dry tons per acre per year). Photo by Ron Zalesny, U.S. Forest Service.

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PREFACE AND EDITORS' NOTE

Ronald S. Zalesny, Jr., Rob Mitchell, and Jim Richardson

We are pleased to present the proceedings of the Short Rotation Crops International Conference: Biofuels, Bioenergy, and Bioproducts from Sustainable Agricultural and Forest Crops held in Bloomington, MN, in August 2008. For quite some time, there has been a substantial need for an international conference integrating biological and social aspects of producing both herbaceous and woody crops for biofuels, bioenergy, and bioproducts. Increasing energy prices worldwide have made alternative sources economically feasible in recent times. Our conference goal was to create an international forum to strengthen old collaborations and create new partnerships to attack some of the pressing issues facing the world's demand for energy. This collection of abstracts represents many of the extensive efforts under way to help understand these issues. We hope these proceedings may help to spark further conversations among scientists, academicians, regulators, and the general public. We encourage you to contact the authors to cultivate such discussions.

We were thankful to work with a productive team of conference organizers (page viii) representing the private and public sectors from a broad range of scientific disciplines. Sponsorship of the conference was phenomenal (page ix). The collective efforts of organizers and sponsors helped create a diverse and balanced program. We are also grateful to Neil Nelson, Tom Schmidt, and Jill Zalesny for reviewing earlier versions of this document, as well as Susan Wright, Rhonda Cobourn and the rest of the production services team who produced these proceedings with a seemingly impossible timeframe. Lastly, we thank the authors for their diligent efforts in preparing abstracts, presentations, and posters, as well as the conference participants for contributing to the networking potential and knowledge base of the overall experience.

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WOODY BIOENERGY SYSTEMS IN THE UNITED STATES

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In the United States, dedicated wood biomass cropland is expected to increase to more than 2 million ha with an average production rate of 18 t/ha. Another 334 million dry t/yr can come from forest residues and wood wastes. However, most wood bioenergy crop systems in the United States are still in the early stages of development, with a wide variety of approaches under test in different regions of the country. The most advanced work focused primarily on energy is with willows in New York grown at stand densities of over 14,300 stems/ha with the first commercial harvest at 4 yrs and a total of seven coppice rotations expected. Ten commercial clones are now available and newer clones with up to 40 percent improvement in yield are under test. Work on fast-growing poplar selections and cultural practices for growing them is also well-advanced in several regions of the country with the current emphasis on bioproducts. This production infrastructure will facilitate future shifts to include biofuels. The largest concentration of plantations is in the Pacific Northwest with about 17,000 ha. Cultural practices vary from irrigated plantations, harvested at ages from 6 to 15 yrs for different products, to 11,000 ha planted to primarily one clone (210 clones under test) on 12-yr rotations in Minnesota, to agroforestry plantings of hybrid aspens yielding 22 t/ha in Iowa at 10 yrs of age. A variety of studies show wood biomass energy production to be the most sustainable, environmentally favorable crop that can be grown in many areas, but much research is still needed to answer specific concerns. Major impediments are the time and cost for establishment, competition with annual crops for land, price competition with bioproduct markets, social resistance to monoculture plantations, the need for more efficiency in harvests, and techniques for drying wood for some energy applications.

KEY WORDS: adoption impediments, cultural systems, *Populus, Salix*, yields

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*** **INVITED SPEAKER** ***