Genetic variation in Miscanthus lutari-origarius

Biochar impacts in a boreal forest

Watershed scale impacts of bioenergy crops
GCB Bioenergy exists to promote understanding of the interface between biological sciences and the production of fuels directly from plants, algae and waste. All aspects of current and potential biofuel production, from forestry, crop production, enzymatic deconstruction and microbial fuel synthesis to implications for society, ecosystem services, economics, policy and global change will be included. Studies may be at all levels of organization from gene discovery and enzyme design to crop feedstock genetics and systems analysis of biofuel production. They may be experimental, observational or theoretical, and may concern higher plant and algal systems, biological mimicry, enzymes, bio-technology, fuel synthesis, ecosystem services, environmental impacts and/or whole production system analysis. GCB Bioenergy will concentrate on primary research articles, but operate a flexible policy regarding other article types, including Platforms, Technical Papers, Mini-Reviews and Opinion Papers.

Information for Subscribers. GCB Bioenergy is published in 6 issues per year and is All newly published articles (submitted from 25 March 2015) will be open access under the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited. All articles published by GCB Bioenergy will be fully open access: immediately freely available to read, download and share. The Creative Commons Attribution License (CC-BY) allows users to copy, distribute and transmit an article, adapt the article and make commercial use of the article. The CC BY license permits commercial and non-commercial re-use of an open access article, as long as the author is properly attributed.

Copyright on any research article published by Global Change Biology is retained by the author(s). Authors grant Wiley a license to publish the article and identify itself as the original publisher. Authors also grant any third party the right to use the article freely as long as its integrity is maintained and its original authors, citation details and publisher are identified. Further information about open access license and copyright can be found at http://www.wileyonlinelibrary.com/hsdm/content/1295db4c3f7 Copyright--License.html. Effective with the 2016 volume, this journal will be published in an online-only format.

Purchasing Print Reprints. Print reprints of Wiley Open Access articles can be purchased from corporatesales@wiley.com.

Back Issues. Single issues from current and prior year volumes are available at the current single issue price from cs-journals@wiley.com. Earlier issues may be obtained from Periodicals Service Company, 11 Main Street, Germantown, NY 12526, USA. Tel: +1 518 537 4700, Fax: +1 518 537 5099, Email: psc@periodicals.com.

Despatch. GCB BIOENERGY (ISSN 1757-1707), is published bimonthly. US mailing agent: Mercury Airfreight International Inc., 565 Blair Road, Avenel, NJ 07001, USA. Periodicals postage paid at Rahway, NJ.

Publisher. GCB Bioenergy is published by John Wiley & Sons Ltd, 9600 Garsington Road, Oxford, OX4 2QD, UK. Tel: +44 (0) 1865 776 868, Fax: +44 (0) 1865 714 591.

Production Editor: Pavane Raj Nagaratnam (gcb@wiley.com)

Journal Customer Services: For ordering information, claims and any enquiry concerning your journal subscription please go to www.wileycustomerhelp.com/ask or contact your nearest office.

Americas: Email: cs-journals@wiley.com; Tel: +1 781 388 8598 or +1 800 835 6670 (toll free in the USA & Canada).

Europe, Middle East and Africa: Email: cs-journals@wiley.com; Tel: +44 (0) 1865 778315.

Asia Pacific: Email: cs-journals@wiley.com; Tel: +65 6511 8000.

Japan: For Japanese speaking support, Email: cs-japan@wiley.com; Tel: +65 6511 8010 or Tel (toll-free): 005 316 50 480.


Disclaimer. The Publisher and Editors cannot be held responsible for errors or consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher and Editors, neither does the publication of advertisements constitute any endorsement by the Publisher and Editors of the products advertised.

Copyright and Photocopying. Copyright © 2016 John Wiley & Sons Ltd. All rights reserved. No part of this publication may be reproduced, stored or transmitted in any form or by any means without the prior permission in writing from the copyright holder. Authorization to copy items for internal and personal use is granted by the copyright holder for libraries and other users registered with their local Reproduction Rights Organization (RRO), e.g., Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, USA, (www.copyright.com), provided the appropriate fee is paid directly to the RRO. This consent does not extend to other kinds of copying such as copying for general distribution, for advertising and promotional purposes, for creating new collective works or for resale. Special requests should be addressed to: permissions@wiley.com.

Access to this journal is available free online within institutions in the developing world through the AGORA initiative with the FAO, the HINARI initiative with the WHO and the OARE initiative with UNEP. For information, visit www.aginternetwork.org, www.healthinternetwork.org and www.oaresciences.org.

For submission instructions, subscription and all other information visit: http://wileyonlinelibrary.com/journal/gcbb.

Wiley’s Corporate Citizenship initiative seeks to address the environmental, social, economic, and ethical challenges faced in our business and which are important to our diverse stakeholder groups. Since launching the initiative, we have focused on sharing our content with those in need, enhancing community philanthropy, reducing our carbon impact, creating global guidelines and best practices for paper use, establishing a vendor code of ethics, and engaging our colleagues and other stakeholders in our efforts. Follow our progress at www.wiley.com/go/citizenship.

Front cover design: Kyooon Heo, Multimedia Designer, Institute for Genomic Biology. Thumbnails 1, 2 and 3: by Juan Yan, Rachel Brimmer & Thomas H. Delucia, and Indrajit Chaubey, respectively.
Primary Research Article

690 Environmental implications of the use of agro-industrial residues for biorefineries: application of a deterministic model for indirect land-use changes
Davide Tonini, Lorie Hamelin and Thomas F. Astrup

Original Research Articles

707 A spatial assessment of potential biomass for bioenergy in Australia in 2010, and possible expansion by 2030 and 2050
Debbie F. Crawford, Michael H. O’Connor, Tom Jovanovic, Alexander Herr, Robert John Raison, Deborah A. O’Connell and Tim Baynes

723 Soil fungal and bacterial responses to conversion of open land to short-rotation woody biomass crops
Chao Xue, Christopher Ryan Penton, Bangzhou Zhang, Mengxin Zhao, David E. Rothstein, David J. Mladenoff, Jodi A. Forrester, Qirong Shen and James M. Tiedje

737 Crassulacean acid metabolism (CAM) offers sustainable bioenergy production and resilience to climate change
Nick A. Owen, Kieran F. Falty and Howard Griffiths

750 Nitrogen rate and landscape impacts on life cycle energy use and emissions from switchgrass-derived ethanol
Eric G. Mbonimpa, Sandeep Kumar, Vance N. Owens, Rajesh Chintala, Heidi L. Sieverding and James J. Stone

764 Genetic variation and bidirectional gene flow in the riparian plant Miscanthus lutarioriparius, across its endemic range: implications for adaptive potential
Juan Yan, Mingdong Zhu, Wei Liu, Qin Xu, Caizun Zhu, Jianqiang Li and Tao Song

777 The effect of biochar management on soil and plant community properties in a boreal forest
Michael J. Gundale, Marie-Charlotte Nilsson, Nathalie Pluchon and David A. Wardle

790 Evaluation of the ECOSSE model for simulating soil organic carbon under Miscanthus and short rotation coppice-willow crops in Britain
Marta Dondini, Mark Richards, Mark Pogson, Edward O. Jones, Rebecca L. Rowe, Aidan M. Keith, Niall P. McNamara, Joanne U. Smith and Pete Smith

805 The priming potential of environmentally weathered pyrogenic carbon during land-use transition to biomass crop production
Gary J. McClean, Will Meredith, Andrew Cross, Kate V. Heal, Gary D. Bending and Saran P. Sohi

818 Candidate perennial bioenergy grasses have a higher albedo than annual row crops
Jesse N. Miller, Andy Vanloocke, Nuria Gomez-Casanovas and Carl J. Bernacchi

826 Utilizing biofuels for sustainable development in the panel of 17 developed and developing countries
Ilhan Ozturk

848 Watershed-scale impacts of bioenergy crops on hydrology and water quality using improved SWAT model
Raj Cibin, Elizabeth Trybula, Indraneet Chaudhry, Sylvie M. Broude and Jeffrey J. Volesky