Denial of long-term issues with agriculture on tropical peatlands will have devastating consequences

Wijedasa, Lahiru S.; Jauhiainen, Jyrki; Könönen, Mari; Lampela, Maija; Vasander, Harri; LeBlanc, Marie-Claire; Evers, Stephanie; Smith, Thomas E.L.; Yule, Catherine M.; Varkkey, Helena; Lupascu, Massimo; Parish, Faizal; Singleton, Ian; Clements, Gopalasamy R.; Aziz, Sheema Abdul; Harrison, Mark E.; Cheyne, Susan; Anshari, Gusti Z.; Meijaard, Erik; Goldstein, Jenny E.

Published in:
Global Change Biology
Publication date:
2017

Publisher rights:
Full Open Access Article. Copyright © 1999 - 2017 John Wiley & Sons, Inc. All Rights Reserved

The re-use license for this item is:
CC BY-NC-ND

The Document Version you have downloaded here is:
Publisher's PDF, also known as Version of record

The final published version is available direct from the publisher website at:
10.1111/gcb.13516

Link to author version on UHI Research Database

Citation for published version (APA):

General rights

Copyright and moral rights for the publications made accessible in the UHI Research Database are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights:

1) Users may download and print one copy of any publication from the UHI Research Database for the purpose of private study or research.
2) You may not further distribute the material or use it for any profit-making activity or commercial gain
3) You may freely distribute the URL identifying the publication in the UHI Research Database

Take down policy
If you believe that this document breaches copyright please contact us at RO@uhi.ac.uk providing details; we will remove access to the work immediately and investigate your claim.

Download date: 21. Dec. 2018
LETTER TO THE EDITOR

Denial of long-term issues with agriculture on tropical peatlands will have devastating consequences

LAHIRU S. WIJEDASA1,2,3,*, JYRKI JAUHIAINEN4, MARI KÖNÖNEN4, MAIJA LAMPELA4, HARRI VASANDER4, MARIE-CLAIRE LEBLANC5, STEPHANIE EVERS6,7,8, THOMAS E. L. SMITH9, CATHERINE M. YULE7,10, HELENA VARKKEY7,11, MASSIMO LUPASCU12, FAIZAL PARISH13, JAN SINGLETON14, GOPALASAMY R. CLEMENTS3,6,10,15,16, SHEEMA ABDUL AZIZ3,6,16, MARK E. HARRISON17,18, SUSAN CHEYNE17, GUSTI Z. ANSHARI19, ERIK MEIJARDA10,21, JENNY E. GOLDFSTEIN22, SUSAN WALDRON23, KRISTELL HEGGOUALC’24, RENE DOMMAIN23, STEVE FROLKING26, CHRISTOPHER D. EVANS27, MARY ROSE C. POSA1, PAUL H. GLASER28, NYOMAN SURYADIPUTRA29, REZA LUBIS29, TRULY SANTIKA21, RORY PADFIELD7,30,31, SOFYAN KURNIANTO24,32, PANUT HADISIWOYO33, TECK WYN LIM34, SUSAN E. PAGE18, VINCENT GAUCI35, PETER J. VAN DER MEER36, HELEN BUCKLAND37, FABIEN GARNIER38, ALJE M. HARRESOON39, HANS JOOSTEN4, RACHEL CARMENTA, XINGLI GIAM, PETER J. VAN DER MEER, HELEN BUCKLAND, FABIEN GARNIER, ALJE M. HARRESOON, HANS JOOSTEN, RACHEL CARMENTA, XINGLI GIAM, PETER J. VAN DER MEER, HELEN BUCKLAND, FABIEN GARNIER, ALJE M. HARRESOON, HANS JOOSTEN, RACHEL CARMENTA, XINGLI GIAM, PETER J. VAN DER MEER, HELEN BUCKLAND, FABIEN GARNIER, ALJE M. HARRESOON, HANS JOOSTEN, RACHEL CARMENTA, XINGLI GIAM, PETER J. VAN DER MEER, HELEN BUCKLAND, FABIEN GARNIER, ALJE M. HARRESOON, HANS JOOSTEN

1Department of Biological Sciences, National University of Singapore, 4 Science Drive 4, 117454, Singapore, 2ConservationLinks, 433 Clementi Avenue 3, #01-258, 120433, Singapore, 3Rimba, Malaysia, Jalan 1/9D, Bandar Baru Bangi, Selangor, MY 43650, Malaysia, 4University of Helsinki, P.O. Box 3 (Fabiininkatu 33), 00014 Helsinki, Finland, 5Faculté des Sciences de l’Agriculture et de l’Alimentation, 2425, Rue de l’agriculture, Pavillon Paul-Comtois, Bureau 1122, Ville de Québec, QC G1V 0A6, Canada, 6School of Biosciences, University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia, 7Tropical Catchment Research Initiative (TROCARI), Kuala Lumpur, Malaysia, 8School of Natural Sciences &

Correspondence: Lahiru Wijedasa & Roxane Andersen, tel. +65-90667160, fax +65-67792486, e-mails: lahirux@gmail.com, Roxane.
Andersen@uhi.ac.uk

© 2017 The Authors Global Change Biology Published by John Wiley & Sons Ltd.
This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.
Psychology, Liverpool John Moores University, Byrom Street, Liverpool L33AF, UK, 4School of Geography, King’s College London, London WC2R 2NA, UK, 4Monash University Malaysia, Jalan Lagoon Selatan, Bandar Sunway, 47500 Subang Jaya, Selangor, Malaysia, 11Department of International & Strategic Studies and Asia-Europe Institute, University of Malaya, 50603 Kuala Lumpur, Malaysia, 13Department of Geography, National University of Singapore, AS2, #03-01, 1 Arts Link, Kent Ridge, 117570, Singapore, 13Global Environment Centre, 2nd Floor, Wisma Hing, 78, Jalan SS2/72, Petaling Jaya, Selangor 47300, Malaysia, 14Sumatran Orangutan Conservation Programme, Jl. Wahid Hasyim No. 51/74 Medan, 20154 Sumatera Utara – Indonesia, 15Kenyir Research Institute, Universiti MalaysiaTerengganu, T145, 21300 Kuala Terengganu, Malaysia, 16Department d’Ecologie et Gestion de la Biodiversit, Muséum National d’Histoire Naturelle, UMR 7179-CNRS-MNHN, 1 Avenue du Petit Chateau, 91800 Brunoy, France, 17Borneo Nature Foundation, Jalan Bukit Raya No. 82 Bukit Raya Palangka Raya, 73112 Central Kalimantan, Indonesia, 18University of Leicester, Leiceste LE1 7RH, UK, 19Centre for Wetlands, People and Biodiversity, Tanjungpura University, Pontianak Tenggara, Barat, 78124 Western Kalimantan, Indonesia, 20Borneo Futures, Country Woods 306, Jalan WR Supratman, Pondok Ranji-Rengas, Ciputat, 15412 Tangerang, Indonesia, 22School of Biological Science, University of Queenslend, University Park Queensland 4072, Australia, 23Remote Sensing Solutions GmbH, Isarstraße 1, 82065 Baierbrunn, Germany, 54Centre for Biological Sciences, University of Cambridge, Downing St, Cambridge CB2 3EJ, UK, 56School of Geographical and Earth Sciences, University of Glasgow, R517B Level 5 GES, East Quadrangle, Main Building, Glasgow G12 8QQ, UK, 24Center for International Forestry Research (CIFOR), P.O. Box 0113 BOCD, Bogor 16000, Indonesia, 25Human Origins Program, National Museum of Natural History, Smithsonian Institution, 10th St. & Constitution Ave. NW, Washington, D.C. 20560, USA, 26Institute for the Study of Earth, Oceans and Space, University of New Hampshire, Durham, NH 03824, USA, 27Centre for Ecology and Hydrology, Environment Centre, Deniul Rd, Bangor LL57, UK, 28Department of Earth Sciences, University of Minnesota, 310 Pillsbury Drive SE, Minneapolis, MN 55455-0231, USA, 29Wetlands International Indonesia Programme, Jl. Bango No. 11, Bogor 16161, Indonesia, 30Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia, 31Department of Social Sciences, Oxford Brooks University, Headington Campus, Oxford OX3 0BP, UK, 32Department of Fisheries and Wildlife, Oregon State University, Nash Hall, 2820 SW Campus Way, Corvallis, OR 97331, USA, 33Orangutan Information Centre, Jl. Sembado XVI, Jl. Bunga Sedap Malam XVIII C No. 10 20131. Kecamatan Medan Selayang Medan, Sumatera Utara 20131, Indonesia, 34Resource Stewardship Consultants Sdn Bhd, Jalan Othman, Petaling Jaya, Malaysia, 35School of Environment, Earth and Ecosystem Sciences, University of Queensland, Brisbane, QLD 4072, Australia, 36Agricultural Research and Development Institute (MARDI), P.O. Box 59, Roban, 95300 Saratok, Sarawak, Malaysia, 37University of Agriculture (CIAT), Km 17 Recta Cali-Palmira, Apartado A 191800 Brunoy, France, 26Crops for the Future, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia, 41School of Politics, History and International Relations, University of Nottingham Malaysia Campus, Jalan Broga, 43500 Semenyih, Selangor Darul Ehsan, Malaysia, 42USDA Forest Service, Northern Research Station, 410 MacInnes Drive, Houghton, MI 49931-1199, USA, 43Proforest, Suite #603, MBE Desa Sri Hartamas No. 30G, Jalan 25/70 A, 50480, Kuala Lumpur, Malaysia, 44School of Life Sciences and Technology, Institut Teknologi Bandung, Jl. Ganesa 10, Coblong, Kota Bandung, Jawa Barat 40132, Indonesia, 45BirdLife International, The David Attenborough Building, 1st Floor, Pembroke Street, Cambridge CB2 3QZ, UK, 46Centre for Tropical Environm</raw_text>
Amsterdamseweg 15, 6814 CM Arnhem, The Netherlands, 66Lancaster Environment Centre, Library Avenue, Lancaster University, Lancaster LA1 4YQ, UK, 67Southeast Asian Biodiversity Society, Raffles Museum of Biodiversity Research, Faculty of Science, The National University of Singapore, Block 56, Level 3, Science Drive 2, 117600, Singapore, 68Wetlands International, P.O. Box 471, 6700 AL Wageningen, The Netherlands, 69Department of Plant Sciences, University of Cambridge, Downing St, Cambridge CB2 3EA, UK, 70Hokkaido University, 5 Chome Kitas 8 Jonishi, Kita Ward, Sapporo, Hokkaido Prefecture 060-0808, Japan, 71NPO Hokkaido Institute of Hydro-Climate, Frontier 14, N 14 W 3, Kita-ku, Sapporo 001-0014, Japan, 72Kyushu Institute of Technology, 1-1 Sensui-cho, Tobata-ku, Kitakyushu-shi, Fukuoka 804-8550, Japan, 73Research and Development Institute on Watershed Management Technology, Research, Development and Innovation Agency, Ministry of Environment and Forestry, Wanahakti Block I 2nd Floor Jalan Jenderal Gatot Subroto Jakarta Pusat, 10270 Jakarta, Indonesia, 74Institute for Environment and Natural Resources, National University at HCM City, 6 Quater, Linh Trung Ward, Thu Duc District, Ho Chi Minh City, Vietnam, 75Peatland Restoration Agency (BRG), UNPAR, Jakarta LPTLH, Indonesia, 76Joint Research Centre of the European Commission, Directorate D – Sustainable Resources – Bio-Economy Unit, Via E. Fermi, 2749, 1-21027 Ispra (VA), Italy, 77Department of Animal and Plant Sciences, University of Sheffield, Western Bank, Sheffield S10 2TN, UK, 78School of Aquatic and Fishery Sciences, University of Washington, University Park, Seattle, WA 98105, USA, 79Faculty of Earth and Life Sciences, University Amsterdam, De Boelelaan 1085-1087, 1081 HV Amsterdam, The Netherlands, 80International Union for Conservation of Nature (IUCN), National Committee of The Netherlands, Plantage Middenlaan 2K, 1018 DD Amsterdam, The Netherlands, 81School of Biological Sciences, Kadoorie Biological Sciences Building, The University of Hong Kong, Pok Fu Lam Road, Hong Kong SAR, China, 82Laboratoire Ecologie Fonctionnelle et Environnement, Université de Toulouse, CNRS, INPT, UPS, 18, Route de Narbonne Bât. 4RI, 31062 Toulouse Cedex 9, France, 83Borneo Orangutan Survival Foundation (BOSF), Jalan Papandayan No. 10, Bogor 16511, Indonesia, 84Institute of Biodiversity and Ecosystem Dynamics, University of Amsterdam, P.O. Box 94248, 1090 GE Amsterdam, The Netherlands, 85School of Geography, University of Nottingham, University Park, Nottingham NG7 2RD, UK, 86School of Geography, Earth and Environmental Science, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK, 87Environmental Change Institute, School of Geography and the Environment, University of Oxford, South Parks Road, Oxford OX1 3QY, UK, 88Nature Society (Singapore), 510 Geylang Road, 802-05, The Sunflower, 389466, Singapore, 89Remote Sensing Centre, Institute of Geodesy and Cartography, ul. Modzelewskiego 27, 02-679 Warsaw, Poland, 90School of Animal Biology, University of Western Australia, 35 Stirling Highway, Crawley, Perth, WA 6009, Australia, 91University of Palangka Raya, Palangkaraya, 73112 Central Kalimantan, Indonesia, 92Wildwood and Wetlands Trust, Queen Elizabeth’s Walk, London SW13 9WT, UK, 93Tropical Forest Ecology and Conservation Division, Faculty of Forestry, Universitas Sumatera Utara, Jl. Dr. Mansur No. 9B, Kampus USU, Padang Bulan, Kota Medan, Sumatera Utara 20155, Indonesia, 94Department of Geophysics and Meteorology, Bogor Agricultural University, Jln. Meranti, Kampus IPB Darmaga, Bogor 16680, Indonesia, 95Department of Global Change Biology Zoology, Oxford Long-term Ecology Laboratory, University of Oxford, The Tinbergen Building, South Parks Road, Oxford OX1 3PS, UK, 96Crawford School of Public Policy, The Australian National University, Acton, Canberra, ACT 2601, Australia, 97Graduate School for International Development and Cooperation, Hiroshima University, 1-5-1 Kagamiyama, Higashi-Hiroshima 739-8529, Japan, 98Asian School of the Environment, Nanyang Technological University, Nanyang Avenue, Singapore, 99International Peatland Society, Nisulankatu 78, 40720 Jyväskylä, Finland, 100World Wide Fund for Nature, Simatupang Towe 2 Unit C 7 Floor Jl. Letjen TB. Simatupang Kav. 38, Jakarta Selatan 12540, Indonesia, 101Faculty of Forestry, Bogor Agricultural University, Jl. Lingkar Akademik Kampus IPB, Dramaga, Bogor, Jawa Barat 16680, Indonesia, 102Grand Challenge Earth Lab, University of Colorado, 4001 Discover Drive Suite S348, Boulder, CO 80303, USA, 103Queen Mary University of London, Mile End Rd, London E1 4NS, UK, 104Land Surface Flux Measurements Group, Centre for Ecology and Hydrology, Maclennan Building, Benson Lane, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB, UK, 105Department of Aquatic Science, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia, 106Centre for Remote Imaging, Sensing and Processing, National University of Singapore, 10 Lower Kent Ridge Road, Blk S17, Level 2, 119076, Singapore, 107Geological Survey of Finland, P.O. Box 97 (Vaasantie 6), FI 67101 Kokkola, Finland, 108Earthly Matters Environmental Consultants, Glenvar, Letterkenny, Co., Donegal, Ireland, 109Research Centre for Biology, Indonesian Institute of Sciences (LIPI), Jl. Raya Jakarta – Bogor Km. 46 Cibenong, 16911 Bogor, Indonesia, 109Department of Soil Science and Land Reclamation, Faculty of Environment and Agriculture, University of Warmia and Mazury, Mikolaj Oczapowskiego 2, Olestyn, Poland, 110Ecological Sciences Group, The James Hutton Institute, Craigiebuckler, Aberdeen, AB158QH Scotland, UK, 111Department of Agriculture Technology, Faculty of Agriculture, Universiti Putra Malaysia, 43400 Serdang, Malaysia, 112Centre for Southeast Asian Studies, Kyoto University, 46 Shimoadauchi-cho, Yoshida Sakyo-ku, Kyoto 606-8501, Japan, 113Southeast Asia Program, Research and Conservation Division, Copenhagen Zoo, Roskildevej 32, 2000 Frederiksberg, Denmark, 114Institute of Biodiversity and Environmental Conservation, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia, 115Environmental Research Institute, University of Highlands and Islands, Castle St., Thurso KW147JD, UK

© 2017 The Authors Global Change Biology Published by John Wiley & Sons Ltd., 23, 977–982
The first International Peat Congress (IPC) held in the tropics – in Kuching (Malaysia) – brought together over 1000 international peatland scientists and industrial partners from across the world (‘International Peat Congress with over 1000 participants!’, 2016). The congress covered all aspects of peatland ecosystems and their management, with a strong focus on the environmental, societal and economic challenges associated with contemporary large-scale agricultural conversion of tropical peat.

However, recent encouraging developments towards better management of tropical peatlands have been undermined by misleading newspaper headlines and statements first published during the conference. Articles in leading regional newspapers (‘Oil palm planting on peat soil handled well, says Uggah, 2016b; Cheng & Sibon, 2016; Nurbianto, 2016a,b; Wong, 2016) widely read across the region portrayed a general consensus, in summary of the conference, that current agricultural practices in peatland areas, such as oil palm plantations, do not have a negative impact on the environment. This view is not shared by many scientists or supported by the weight of evidence that business-as-usual management is not sustainable for tropical peatland agriculture.

Peer-reviewed scientific studies published over the last 19 years, as reflected in the Intergovernmental Panel on Climate Change (IPCC) Wetland Supplement on greenhouse gas inventories, affirm that drained tropical peatlands lose considerable amounts of carbon at high rates (Drösler et al., 2014). Tropical peat swamp forests have sequestered carbon for millennia, storing a globally significant reservoir below ground in the peat (Page et al., 2011; Dommmain et al., 2014). However, contemporary agriculture techniques on peatlands heavily impact this system through land clearance, drainage and fertilization, a process that too often involves fire. Along with biodiversity losses driven by deforestation (Koh et al., 2011; Posa et al., 2011; Giam et al., 2012), the carbon stored in drained peatlands is rapidly lost through oxidation, dissolution and fire (Coughenber et al., 2009; Hirano et al., 2012; Ramdani & Hino, 2013; Schriever-Uijl et al., 2013; Carlson et al., 2015; Warren et al., 2016). Tropical peat fires are a major contributor to global greenhouse gas emissions and produce transboundary haze causing significant impacts on human health, regional economies and ecosystems (Page et al., 2002; Marlier et al., 2012; Jaafar & Loh, 2014; Chisholm et al., 2016; Huijmen et al., 2016; Stockwell et al., 2016). With future El-Niño events predicted to increase in frequency and severity (Cai et al., 2014) and with fire prevalence now decoupled from drought years (Gaveau et al., 2014), future large-scale fire and haze events are imminent given the extensive areas of now-drained fire-prone drained peatlands (Kettridge et al., 2015; Turetsky et al., 2015; Page & Hooijer, 2016).

In reality, just how much of the estimated 69 gigatonnes of carbon (Page et al., 2011) stored in South-East Asian tropical peatlands is being lost due to agricultural operations under the current management regime is still uncertain. Of great concern is that none of the agricultural management methods applied to date have been shown to prevent the loss of peat and the associated subsidence of the peatland surface following drainage (Wosten et al., 1997; Melling et al., 2008; Hooijer et al., 2012; Evers et al., 2016). Recent projections suggest that large areas of currently drained coastal peatlands will become undrainable and progressively be subjected to longer periods of inundation by river and ultimately sea water (Hooijer et al., 2015a,b; Sumarga et al., 2016). With growing risk of saltwater intrusion, agriculture in these coastal lands will become increasingly untenable, calling into question the very notion of ‘long-term sustainability of tropical peatland agriculture’.

A more accurate view of drained peatland agriculture is that of an extractive industry, in which a finite resource (the peat) is ‘mined’ to produce food, fibre and fuel, driven by global demand. In developing countries with growing populations, there are strong socio-economic arguments for exploiting this resource to support local livelihoods and broader economic development (Mizuno et al., 2016). However, we must accept that ongoing peat loss is inevitable under this scenario. Science-based measures towards improved management, including limitations on the extent of plantation development, can be used to minimize the rate of this peat loss (President of Indonesia, 2011). Such an evidence-based position, supported with data and necessary legal instruments, is needed for sustainable futures. The scientifically unfounded belief that drained peatland agriculture can be made ‘sustainable’, and peat loss can be halted, via unproven methods such as peat compaction debilitates the effort to find sustainable possibilities. To a large extent, the issues surrounding unsustainable peatland management have now been recognized by sections of industry (Wilmar, 2013; APP, 2014; Cargill Inc., 2014; Mondelēz International, 2014; Sime Darby Plantation, 2014; APRIL, 2015; Olam International, 2015), government (President of Indonesia, 2014, 2016, Mongabay, 2015; Mongabay Haze Beat, 2015; Hermansyah, 2016) and consumers (Wijedasa et al., 2015). In recognition of the constraints and risks of peatland development, many large and experienced oil palm and pulpwood companies have halted further development on peat and introduced rigorous management requirements for existing peatland plantations (Lim et al., 2012). However, the denial of the empirical basis calling for improved peatland management
remains persistent in influential policy spaces, as illustrated by the articles reporting on the ‘Oil palm planting on peat soil handled well, says Uggah, 2016b; Cheng & Sibon, 2016; Nurbianato, 2016a,b). The search for more responsible tropical peatland agriculture techniques includes promising recent initiatives to develop methods to cultivate crops on peat under wet conditions (Giesen, 2015; Dommain et al., 2016; Mizuno et al., 2016). While a truly sustainable peatland agriculture method does not yet exist, the scientific community and industry are collaborating in the search for solutions (International Peat Society, 2016), and for interim measures to mitigate ongoing rates of peat loss under existing plantations. Failing to recognize the devastating consequences of the current land use practices on peat soils and failing to work together to address them could mean that the next generation will have to deal with an irreversibly altered, dysfunctional landscape where neither environment nor society, globally or locally, will be winners.

Acknowledgements

Open access facilitated by Greifswald Mire Centre and Department of Forestry Sciences, University of Helsinki.

References

International Peat Congress with over 1000 participants! (2016a) PeatNews.
International Peat Society (2016) Statement regarding the Jakarta Post article of 18th August.
Mongabay (2015) Jokowi to oversee Indonesia peat restoration agency but details thin on the ground. Mongabay.
President of Indonesia (2011) Instruction of the President of the Republic of Indonesia number 10 of 2011 about suspension of granting of new licenses and improvement of governance of natural primary forest and peatland.

© 2017 The Authors Global Change Biology Published by John Wiley & Sons Ltd., 23, 977–982
President of Indonesia (2014) Government Regulation Number 71 of year 2014 about Protection and Management of Peat Ecosystems.

President of Indonesia (2016) Presidential Regulation Number 1 of year 2016 About Peat Restoration Agency.


Wong J (2016) Yield of oil palm on peatland can be doubled. The Star.


© 2017 The Authors Global Change Biology Published by John Wiley & Sons Ltd., 23, 977–982