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LETTER TO THE EDITOR

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

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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; Dommain *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 (Couwenberg *et al*., 2009; Hirano *et al*., 2012; Ramdani & Hino, 2013; Schrier-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; Huijnen *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 (Wösten *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 conference ('Oil palm planting on peat soil handled well, says Uggah, 2016b; Cheng & Sibon, 2016; Nurbianto, 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.

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