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

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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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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 (Wöstien 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 undrivable 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 pulpwod 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 controversy (‘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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References


Mongabay (2015) Jokowi to oversee Indonesia peat restoration agency but details thin on the ground. Mongabay

Mongabay Haze Beat (2015) Jokowi pledges Indonesia peatland “revitalization” to stop the burning. Mongabay


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.