POLICY BRIEF

Agroforestry on peatlands:
combining productive and protective functions as part of restoration

AWG-SF
ASEAN Working Group on Social Forestry

Schweizerische Eidgenossenschaft
Confédération suisse
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Prepared by World Agroforestry Centre Southeast Asia Regional Program
in collaboration with the ASEAN Working Group on Social Forestry

World Agroforestry Centre (ICRAF) Policy Brief No. 70

Peatland agroforest of jelutung 'Dyera polyphylla (Miq) Steenis', areca nut and coconut trees in Tanjung Jabung Barat, Jambi, Indonesia

Photo: Hesti Lestari Tata

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List of acronyms and abbreviations

AMS	ASEAN Member State
ASEAN	Association of Southeast Asian Nations
ASFCC	ASEAN-Swiss Partnership on Social Forestry and Climate Change
AWG-SF	ASEAN Working Group on Social Forestry

Agroforestry, a contraction of the terms agriculture and forestry, is land use that combines aspects of both, including the agricultural use of trees.

The ASEAN countries, in particular Indonesia and Malaysia, are home to the world's largest tropical peat stocks and have suffered the brunt of the conversion from natural forest cover to 'fastwood' (trees grown for pulp and paper), oil-palm plantations and other agricultural use. In order to control the use of fire and to avoid the deep drainage that is responsible for degradation, government commitments need to go beyond good intentions alone. Land-use solutions are needed that provide local livelihoods while keeping the peat profiles wet. Fortunately, certain forms of agroforest offer solutions and can be promoted more widely.

No.	Key findings	Policy implications
1	Many peat areas in the past were seen as abandoned land with the potential for other uses, with management jurisdiction often not clearly falling within a single region or sector; Active management and restoration requires coordination across local borders and between sectors.	Land governance needs to evolve to allow effective restoration and conservation of peat domes, coordinated across local borders and between sectors.
2	Community-developed peatland management methods, such as agroforests, which can produce economically-viable commodities, have good track records.	These land uses serve as good practices in bridging productive and protective functions at landscape level.
3	Restoration, rewetting and fine-tuned drainage will have benefits at national, regional and global scales, deserving of co-investment in integrated planning. This is in line with the ASEAN Peatland Management Strategy 2006–2020 on the promotion of integrated management and community livelihoods.	Wise use of peatland, combining agroforestry and the paludiculture, needs to be considered in their social, economic and ecological contexts. With value chains of traditional peat-based commodities under pressure, local livelihoods need to be secured. Agroforestry practices deserve to be promoted in this context.
4	Challenges to integrated peatland restoration include lack of adequate institutions to manage trade-offs, lack of local capacity to innovate, and historical low trust levels between government and local communities.	Too much focus on rapid physical results can be counterproductive if the local context needs more trust, while regulatory restrictions need to be accompanied by support for 'green' value chains.

1. Introduction

Figure 1. Degraded and partially burnt peatland opened for agriculture. Photo: World Agroforestry Centre/Atiek Widayati

In Indonesia, the country with the largest tropical peatlands in the world (Rieley and Page 2016), utilization of peatlands has been widely associated with CO_2 emissions, including those from fires, and with environmental and health issues due to fires and haze. Indonesia became known as the country with the highest land-use-based CO_2 emissions (Indonesia Forest Climate Alliance 2008). The fire seasons of 2013 (Ekadinata et al 2013) and 2015 (Tata et al 2015) had major negative impacts on neighbouring countries, as well as in the source areas. Of the total peatland area of approximately 14.8 million hectares, 6.8 million hectares is still intact, 3.9 million degraded and 3.4 million is used for agricultural or forestry production (Wahyunto et al 2014). Research has clarified the way peat responds to drainage and land clearing by fire; the Intergovernmental Panel on Climate Change has revised emission factors for tropical peatlands that take the latest results into account (van Noordwijk et al 2013, 2014). After an initial period of denial, governments are now committed to reduce emissions and fire use, including initiatives developed at the regional level, such as the ASEAN Peatland Management Strategy 2006–2020 (ASEAN Secretariat 2014). But how best to achieve this goal? How can local livelihoods be secured? Our review of evidence and experience led us to several findings and recommendations.

2. Evolution from abandonment to active management and restoration

Peatlands mainly formed in former floodplains and areas in between rivers. They tended to have low human population density, with settlements linked to rivers. When land and forest were still largely available for logging and settlements, the peatlands were mostly left untouched. On the edges of the peat, however, local settlements appeared and settlers grew crops that did not require deep drainage. Inspired by the success of these traditional peatland agriculture practices by local people, a major state-based agricultural development scheme was initiated in the mid-1990s, opening 1 million hectares of peatland in Central Kalimantan for rice fields with intensive drainage. Unfortunately, this 'mega-rice project' suffered from faults in the concept, design and management (Mawardi 2007) and was eventually considered a failure (Galudra et al 2011).

In absence of regulation and technical silvicultural guidelines (Istomo et al 2010), deforestation and forest degradation occurred, further exacerbated by a lack of law enforcement. Forest timber extraction in Indonesia was expanded in the 1970s, causing exploitation of natural forests, including peatswamp forest. Canals were constructed for both log transport and drainage. Forest-timber plantations depending on deep drainage were later developed and flourished, triggered by demands from the pulp and paper industries. These industrial plantations, including those of oil palm, massively expanded into peatlands, occupying 15–16% of all Indonesia's peatlands (Wahyunto et al 2014).

Early expansion into peatland was largely the fault of a lack of data and information about the importance of these ecosystems and the general perception of them being abandoned and unproductive land. However, expansion continued in violation of new policy and regulations (Evers et al 2016). Approaches for improved land and water management in plantation areas were promoted and even recognized in a regulatory framework but counter-arguments later rejected the claim to sustainability of such an approach in drained peatlands and discussions on sustainable uses still continue (Evers et al 2016, Wetlands International and Tropenbos International 2016, Wijedasa et al 2016).

In responding to the heightened environmental issues, including greenhouse-gas emissions and fires and haze, the past decade has witnessed waves of emerging policies and initiatives. Government regulations for managing peatland ecosystems–including minimum water levels, the establishment of a new Peatland Restoration Agency (Badan Restorasi Gambut) and a moratorium on concessions (timber, pulp and paper, and oil palm) on peatland represent some of the most distinctive efforts to solve the problems. However, some elements resist action and remain pessimistic about the effectiveness of these efforts.

Box: Peatlands in Southeast Asia

There are different estimates and maps of peatland areas in ASEAN countries, one of which is by ASEAN Peatlands Forest Project (Figure 2). Scattered over Sumatra, Kalimantan and Papua, Indonesia's peatlands are the largest in ASEAN and are estimated to cover 14.8 million hectares (Wahyunto et al 2014). Estimations of peatland areas in other ASEAN countries are 2.6 million hectares for Malaysia, 53,300 for Viet Nam, and 64,500 for the Philippines (Rieley and Page 2016). Peatlands in the Philippines and Viet Nam experience low pressure from utilization and conversion to agricultural land, while in Malaysia the pressure is higher where oil-palm plantations have already converted around 340,000 hectares (13%) of peatland (Koh et al 2011). For Viet Nam, despite the small area, ongoing conservation efforts have kept a 32,500 hectares peatswamp ecosystem intact by designating it as a national park.

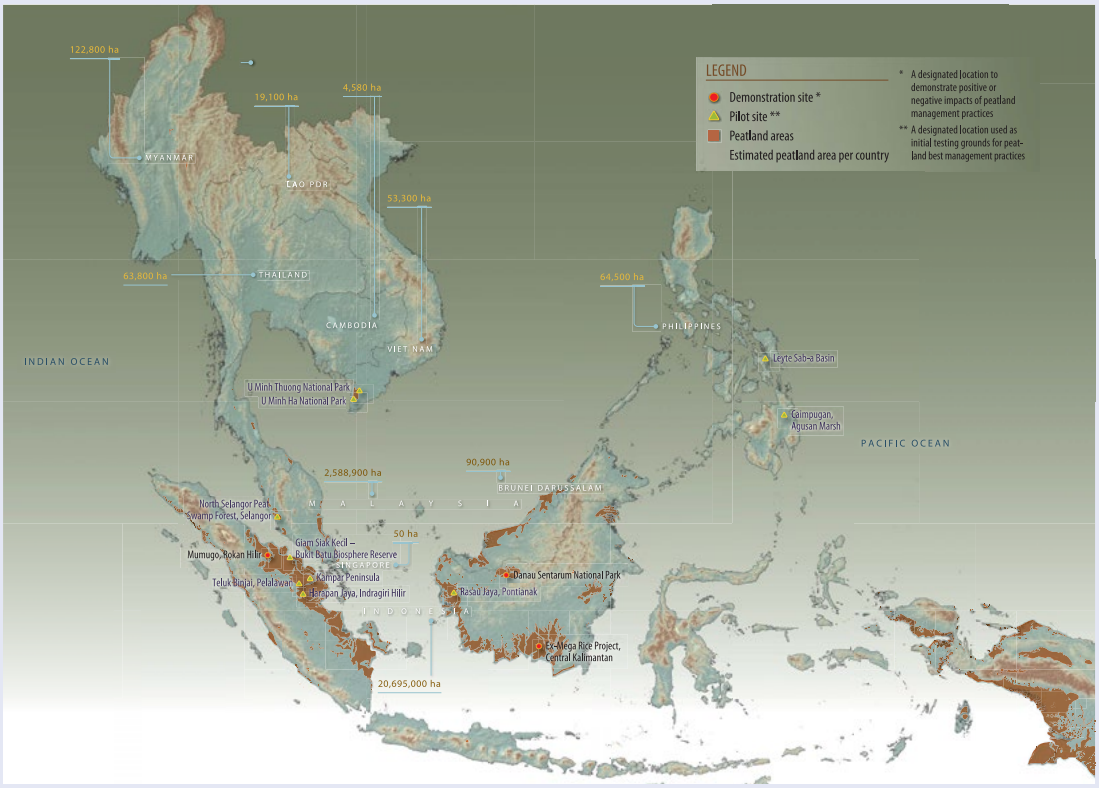

Figure 2. Peatland distribution in Southeast Asia according to ASEAN Peatlands Project, 2010-2016 (source: www.aseanpeat.net)

3. Agroforestry and community-developed peatland management

In contrast to the track record of large-scale peatland conversion schemes, smallholders' practices with limited modification of the drainage pattern have long tackled environmental challenges modestly to meet livelihoods needs. These are estimated to cover 11 to 23% of the total peatland area (Wahyunto et al 2014, Miettinen et al 2016). Shallow peatlands in Kalimantan and Sumatra have been cultivated with agricultural crops, such as pineapple, ginger and galangal, by local inhabitants (Nursyamsi et al 2016, Osaki et al 2016). Agroforests in which planted trees along with spontaneously-established but retained trees grow together have been part of the landscape since the 1970s on the fringes of peatland on the east coast of Sumatra's Jambi Province. Early migrants from Java, Kalimantan and Sulawesi took advantage of forest commodities from the undrained peat swamps, such as latex from 'jelutung' (*Dyera polyphylla* (Miq) Steenis), for income, supported by favourable markets and industrial demand. Land conversion by these smallholders took place in the more degraded forest areas, with drainage developed as narrow and shallow canals that maintained high water levels in the peat. Agroforests developed as a combination of coffee, coconuts, areca nut and, to a lesser extent, rubber, jelutung and pineapple (Figure 3). These practices have shown to be effective buffers against fires, shown by the low incidence of fires in their areas (Sakuntaladewi and Wibowo 2016, Dewi et al 2015).

Figure 3. Multi-species and multi-strata agroforests on peatland in Jambi, Indonesia. Photos: World Agroforestry Centre/Hesti Lestari Tata (left)/Atiek Widayati (right)

Peatland agroforests survived amidst the allure of oil-palm development due to their diversified commercial commodities that can shield livelihoods from fluctuating prices and capricious markets. The lure of oil palm, instead, has taken its toll on logged-over forest in the vicinity perceived as open-access area or through illegal land markets practiced on state forestland. These phenomena, including conversions to accommodate other agricultural production, are common triggers of land conflicts in forest margin areas. Legal measures, including reinforcement of protection functions or conservation rules, came only when the clearing and development had already taken place, widely causing land conflicts involving farmers, government authorities and concession companies.

Community forestry in the forms of community-based management schemes or other partnership types can come as a win-win solution for tenurial conflicts that involve farmers occupying state-owned forestland. This is especially crucial for encroachments and conflicts in peatlands where regulated management should be well in place. Management rights are given as an incentive to manage the area under existing regulations and guidelines. Agroforestry can serve as a feasible management practice to bridge production and protection functions, creating adaptive co-management strategies towards the sustainable and integrated management of peatlands.

4. Peatland restoration options adapted to each context

Peatland restoration and rehabilitation are high on the agenda to prevent fires in anticipation of long dry seasons and El Niño events as well as to reduce greenhouse-gas emissions. For Indonesia, the target is 2 million hectares, most of which are on the islands of Sumatra and Kalimantan. Rewetting of peatland is promoted to restore the functions by blocking, fully or partially, existing drainage canals.

Paludiculture (from Latin palus 'swamp' and culture 'cultivation') is a wetland agricultural practice that produces biomass from wet and rewetted peatlands while maintaining the peatland's natural conditions (Biancalany and Avagyan 2014, Wichtmann et al 2016). Along with rewetting, paludiculture is promoted with both timber species and non-timber commodities that can provide economic returns like jelutung (Tata et al 2016), sago (*Metroxylon sago* K.D.Koenig), nypa (*Nypa fruticans* Wurmb), illipe nut (*Shorea macrophylla* (V.) P.S. Ashton), and candle nut (*Aleurites moluccanus* (L.) Willd.) (Giesen 2015, Tata and Susmianto 2016).

In some contexts with existing practices, enriching partially drained peatland and improving water management can already improve the land management, for example in areas where rewetting is not feasible immediately due to constraining factors. These practices normally represent long maintained small-holder farming characterized with local socio-economic conditions, including tree-crop preferences and local wisdom, and cover mosaics of landscapes in contrast with vast industrial plantation areas (see Section 2; Jewitt et al 2014).

In this regard, peatland-adaptive land management is in order. This practice buffers against the risk of fires and floods. Operative principles include zero burning, for example, for land clearing, reducing the number of drainage canals to keep the peatland moist, selecting tree and crop species that tolerate high soil moisture, and preventing or minimizing peat oxidation by avoiding tillage, applying multi-strata planting or planting with

shade trees to keep surface temperatures low and reducing fertilization (Joosten et al 2012). Reinforcements of such efforts should be aligned with clear policies, good facilitation and by providing technical guidelines and capacity strengthening to land managers, such as through advice to farmers and government programs in peatland villages.

Options for improved peatland management should be based on the context determined by a wide range of factors, which encompass hydrological conditions, current land use, peat characteristics/typology, land-use policy, land tenure, and conservation or protection agenda. Essentially, peat-landscape governance should be well considered. An approach based on options-by-context can be adopted for rehabilitation or restoration purposes. For areas allowed to have productive functions, this may mean agroforestry, paludiculture or a combination of them, while for other areas where conservation agenda is high in priority, the target can be restored peatswamp ecosystem (Figure 4).

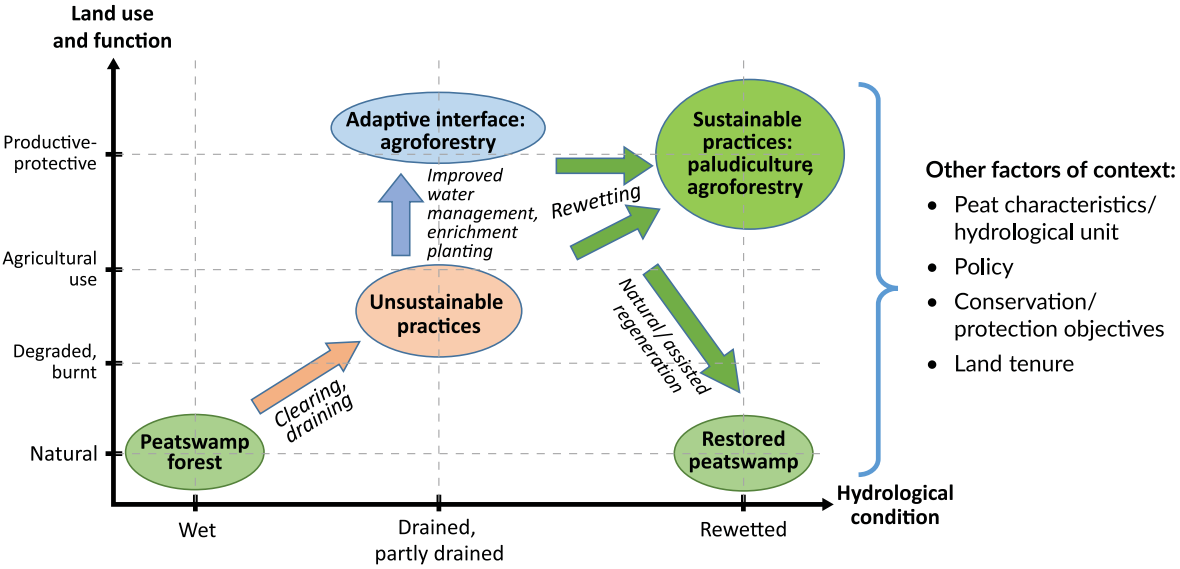

Figure 4. Options-by-context approach in peatland management choices for rehabilitation and restoration

5. Agroforestry for sustainable peatland management

Peatland agroforests can be both a practice to be maintained and an option for rehabilitation and restoration. This practice has long catered to local livelihood needs while already-drained peatland can be saved from further degradation or fire. For degraded or burnt peatland, multifunctional agroforested landscapes can restore the peatland's productive function while protecting it from further degradation, over-drainage and other related hazards. This approach is recommended where local livelihoods have to be sustained.

As part of larger landscape restoration programs, this rehabilitation concept can fit into a particular zone that can accommodate the production function, for example, in the shallow peat on the fringes of degraded ecosystems, where villages and communities have been part of the landscape or as an enriched tree-crop replacement for monocultural practices. In a large-scale management context, this option may be explored as part of a restoration and rehabilitation effort in industrial plantation concession areas.

In the ASEAN context, peatland agroforests are perfectly aligned with the strategic thrusts of the Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry 2016–2025, where agroforestry systems are explicitly mentioned as ways to increase resilience to climate change and other disasters, and which mandates action to address forest and peatland fires under sustainable forest management (ASEAN Ministers of Agriculture and Forestry 2015). In particular, it is also in line with the operational objectives of the ASEAN Peatland Management Strategy 2006–2020, which promotes integrated approaches and small-scale, community-based livelihoods (ASEAN Secretariat 2014).

6. Opportunities and challenges for agroforestry on peatlands

While restoration, rehabilitation and protection include aspects that support livelihoods, the economy and multifunctionality (such as in choice of species), challenges are to be anticipated as much as the range of options offers new opportunities.

The opportunities for more sustainable and long-term economic value of rehabilitation and restoration species and management strategies have been studied mostly as part of pilot and commodity-based projects. Several rehabilitation species only have limited market niches and value chains and, in contrast to mainstreamed commercial species, entail a higher risk when demand becomes uncertain, drops, or even disappears.

Agroforestry practices that bridge economic values and environmental functions, as well as offering diversified commodities for buffering fluctuations and hazards, are not considered the most economically-attractive option due to their limited scale. Challenges exist in mainstreaming this option beyond small-scale practices. For peatlands, however, the need to adopt and mainstream agroforestry, including the need for rewetted environments, is stronger than on mineral soils, since the environmental risks from fire and greenhouse-gas emissions are otherwise very high.

Enabling policies and mechanisms as well as capacity strengthening are prerequisites for restoration and environmental protection, especially where local livelihoods are at stake. Such policies should be created at the right nodes along the value chains, from seedling provision to market policies or market access. These may also include incentive mechanisms as part of 'green' initiatives. Development of partnerships is important for strengthening mutual cooperation. Capacity strengthening is crucial, especially at local levels, and should also occur along the value chain as part of reducing vulnerability to various uncertainties. These are key for the sustainability of the efforts of land managers in the landscapes beyond the original rehabilitation or restoration programs.

7. Recommendations

- Agroforestry practices that have been well established in degraded shallow peatlands should be recognised properly by national and subnational bodies while taking note of the restrictions imposed by the peatland's characteristics or typology.
- Rehabilitation and restoration programs should take into account agroforestry practices and promote them as part of low-impact agricultural practices in existing peatland agricultural areas, as stated in the ASEAN Peatland Management Strategy.
- The potential of agroforestry for certain areas or allocated zones within large-scale practices and larger landscape management should be explored and well documented.
- Policies and regulations should be developed aligning agroforests and peatland rehabilitation and restoration efforts. In addition, there should be guidelines to ensure the right context for its promotion.
- To align with the promotion of suitable tree-crop species and commodities, markets, value chains and enterprise development should become a part of rehabilitation and restoration programs in the forms of enabling policies, incentive mechanisms, partnerships and capacity strengthening.
- Further research and assessments are needed to fill the remaining knowledge gaps on the environmental consequences of peatland management options.

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Authors

Atiek Widayati (a.widayati@cgiar.org)
Hesti Lestari Tata (hl.tata@gmail.com)
Meine van Noordwijk (m.vannoordwijk@cgiar.org)

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For more information, contact

AWG-SF Secretariat
Manggala Wanabhakti Building, Block VII, 4th Floor,
Jalan Gatot Subroto, Senayan, Jakarta 10270, Indonesia
Tel: +62-21-5703246, ext 478 - Fax: +62-21-5730136

World Agroforestry Centre (ICRAF)
Southeast Asia Regional Program
Jl. CIFOR, Situ Gede, Sindang Barang, Bogor 16115
[PO Box 161, Bogor 16001] Indonesia
Tel: +(62) 251 8625415 | Fax: +(62) 251 8625416
Email: icraf-indonesia@cgiar.org
www.worldagroforestry.org/region/southeast-asia
blog.worldagroforestry.org

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ASEAN Working Group on Social Forestry (AWG-SF) is government-initiated network that aims to strengthen social forestry in Southeast Asia through the sharing of information and knowledge. AWG-SF established by the Association of Southeast Asian Nations (ASEAN) Senior Officials on Forestry (ASOF) in August 2005, linking government forestry policy makers directly with the civil society organizations, research organizations, academia, private sector, and all of whom share a vision of promoting social forestry policy and practices in ASEAN.

The **ASEAN-Swiss Partnership on Social Forestry and Climate Change (ASFCC)** is a Partnership Programme of ASEAN that aims to contribute to the ASEAN Mandate and Policy Framework through support for the ASEAN Working Group on Social Forestry and the ASEAN Multi sectoral Framework on Climate Change towards Food Security.