

Abstract No: A-454

**WHAT IS THE WAY FORWARD ON INDONESIAN PEATLAND?**

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Indonesian peatland has now become the global topic in relation with environment problems including land fires, declining massive ecosystem functions, and increasing carbon emission. Agricultural activities on it are currently seen as an irresponsible development which created those environmental catastrophes especially land fires, instead of climatic problem. This was responded by the government policies which prohibit peatland conversion, restrict ground surface water level not more than 0.4 meter for cultivated peatland, and develop peatland restoration program. Peatland cultivation in Indonesia has been started a long time ago since 1910s where Banjarese and Buginese migrated to the tidal zone peatland of Kalimantan and Sumatera. This was followed by transmigration program which reclaimed peatland for crops cultivation in Sumatera and Kalimantan. Unfortunately, poor knowledge and understanding on tropical peatland has brought many negative consequences. There were not enough in depth study whereby. Inappropriate drainage canals were applied on shallow peat layers with underlying potential acid sulfate soil which results in the exposure of pyritic sediments. However, at present with the better understanding on tropical peatland and with better technology, the management peatland has improved. Canal systems with water gate and overflow based on topography information have successfully controlled water level and drained only surplus water. This particularly true for large concession of oil palm and pulp plantations in Riau which have been applying that technology. For provinces where peat is dominant such as Riau, Jambi, and South Sumatera, peatland plays a very important role in alleviating local farmers from poverty and at the same time brings economic benefit for larger community through multiplier effects. For many years, peatland cultivation has provided a huge amount of experiences for people from different education levels, background, and culture to learn that Indonesian peatland is unique and complex. This can not only be seen as a single soil type that should be preserved, but there have been many social, cultural, and economic activities on it since a long time ago that should also be considered. The critical issue now is how to bridge among social, economic, and environment purposes to address sustainable development. Constructive perception, better knowledge and tranquil inputs based on scientific evidences are discussed to build up an appropriate strategy for better future of Indonesian peatland.

**Keywords:** *peatland, sustainable management, social, economic***INTRODUCTION**

Peatland is now become the global topic in relation with massive utilization for various purposes that is capable of causing environment problems including land fires, declining massive ecosystem functions, and increasing carbon emission. In relation with greenhouse gases emission, alteration of peat for agriculture by lowering of water table is frequently associated with increasing number of carbon dioxide (CO<sub>2</sub>) emission (Hooijer *et al.*, 2010; Page *et al.*, 2010; 2011). In fact, lowering water table is also recorded to take place in natural ecosystem where water level of peatland is influenced by seasonal rainfall. Massive release of CO<sub>2</sub> is also predicted to occur during massive land fire on peat in Indonesia along the year 2015. Page *et al.* 2002 has reported that peat fire in Indonesia in 1997 has resulted in massive carbon release that is expected to contribute to global greenhouse gas emission.

Land fire has been recorded to occur by year to year. First record of land fire was documented in 1982-1983 in East Kalimantan (*Dirjen Perlindungan Hutan dan Pelestarian Alam* 1983). Land burning was originally a traditional knowledge in local community to prepare land for cultivating cash crop because it was cheap and believed that burned land will return into fertilized land. The most phenomenal case of land fire was recorded in 2015, where many areas in Sumatera and Kalimantan burned out and created a dangerous air quality which impacted on sickness and death.

Agricultural activities on peat are now seen as an irresponsible development which created land fires along 2015, instead of climatic problem. This is particularly true since many cases of land fires are found in areas where agriculture activities are on peat soil including Riau, Jambi, and South Sumatera. However, it cannot be disregarded

that longer dry season due to EL-NINO phenomenon was one reason why fire become massive disaster. Opinion to blame cultivated peat as main driving factor of land fire kept continuing along the year of 2015 until now. This can be seen from many discussions (workshops, conferences, focus group discussion) conducted at various levels from local to international that was then followed by many opinions coming from different people from different background about peat fires on many newspapers and magazines. This was then responded by the Government to take progressive actions and policies to tackle land fire especially on peatland, one of which is the policy to stop planting for both forestry plantation and oil palm on peatland.

Peat cultivation in Indonesia has been started since many years ago. Technology to tackle peatland for agriculture also gradually develops by year to year. Today, many peatland areas are cultivated for various cash crops across islands and successfully help local people to survive and grow. As an example, Riau Province, where massive peatland is found, there are many activities on it including agriculture, social, and culture. In essence, peatland problem is not only about technique, but it should also touch many aspects including culture and local economic situation.

Thus, the purpose of this paper is to discuss about the future shape of peatland in Indonesia by involving current policies, practices, technologies, and socio-economic situation of the local community. Through this analyses, we expect to have a blue print on how tackling today's peat problem to adapt the future.

### **GOVERNMENT POLICIES TO RESPOND PEATLAND RELATED FIRES**

Peatland cultivation is now frequently associated with land fires that result in tremendous environmental catastrophes and health problem. This was then responded by the Government through Ministry Letters 3<sup>rd</sup> and 5<sup>th</sup> November that new planting for both oil palm and forestry plantation on peatland is no longer allowed including those are in the approved concession. Main objective of those two letters is to prevent land fire from peatland. These two policies seem to localize fire problem only on cultivated peat with less attention to others. In fact, based on public information available on the website, (see <https://fires.globalforestwatch.org>), hot spots recorded from peatland along 2015 was found to be lower than 50%, in contrast more than 50% of hot spots were found in mineral soil. About 61% hot spots were found in outside concession. Therefore, more attention should be paid to mineral land.

Increasing concern on the increasing number of degraded peat and the urgency for restoration program for burned peat has triggered the Government, in January 2016, to establish Peat Restoration Agency with the aim to develop restoration program for more than two million burned peat land. In line with above policies, The Ministry of Environment and Forestry has also been pushed for the implementation of President Regulation No 71, which restrict ground water level (GWL) not more than 0.4 meter for cultivated peatland. Peat soil is determined as a broken peat when the GWL is found to be lower than 0.4 meters. Unfortunately, there is no scientific evidence has proved that peat with GWL below 0.4 meter is biologically, physically, or chemically broken. This regulation has called many debates among scientists, growers, and environmentalists regarding why this parameter used as an indicator of broken peat. There should be some prior baseline research to implement the regulation since it will bring some negative consequences on yield loss from suffering plantation with water level cannot be lower than 0.4 meter.

### **PEATLAND CULTIVATION IN INDONESIA: LEARNING FROM THE PAST, ADAPTING FOR THE FUTURE**

Peat (or in Indonesia *Gambut*) was named after *Gambut* Sub-district, near Banjarmasin City of South Kalimantan. In the past, people (especially most of local people), always avoid using peat for settlement and agriculture for many reasons. The main reason is that peat is very acid and its productivity is very low. In the Dutch colonial period, the channel construction to develop the area around the peatland is mainly for improvement of transportation means instead of agriculture. Peatland use for agriculture is often considered as not feasible by the Dutch government. Pons and Driessen (1975) reported that Indonesia peatlands generally have a very low level suitability for agriculture.

However, different story was recorded for Banjarese and Buginese who started to utilize peatland for agriculture in Indonesia since 1910s when they migrated to the tidal zone peatland of Kalimantan and Sumatera. Banjar and Bugis communities implement certain method to manage peatland for agriculture in South and West Coasts of Kalimantan and east coast Sumatra starting from selecting land, making channels, managing water system, cultivating soil, planting, to harvesting, they all do traditionally in a *Handil* system. The *Handil* system is implemented by creating a main channel that is more or less almost perpendicular to the river. Learning from the local people experience, the Dutch government, according to Polak (1949) report, cleared peatlands for agricultural expansion in Lakbok Marsh, West Java. In Pulau Petak Delta, South Kalimantan cleared Sarapat, Tamban and Talaran *Anjirs* (Channel). In addition, the Dutch government at the beginning of the Republic of Indonesia independence has tried to practice the *polder* system (closed irrigation system), designed and implemented by Dr.

H.J. Schophuys in Sungai Utara Upstream, which then is known as the Polder Alabio. All things done have given very significant outcomes on the increased agricultural production at the time.

Transmigration program which reclaimed peatland for crops cultivation in Sumatera and Kalimantan was the next era in peat cultivation. Then, with the background of the needs to supply food mainly rice that keeps increasing, in line with population growth on one hand and on the other hand the limited area available in Java, Indonesian government through P4S began to clear swamp land in 1969 to develop agriculture, particularly crop agriculture, which was associated with transmigration program. The number of transmigrant people placed in some locations during the period 1969/1970 – 1999/2000 were 1,150,902 (Tirtosudarmo 2004). However, since early 1980s, the private sectors are also being given the opportunity to clear and develop peatlands for plantation (such as coconut and oil palm plantation), and Industrial Plantation Forest (HTI).

The history of peat management for agriculture in Indonesia cannot be separated from the failure of 1 million ha peatland project for agriculture in Central Kalimantan in 1996. This project was part of transmigration program developed by the Government under Suharto Regime. Unfortunately, poor knowledge and understanding on tropical peatland has brought many negative consequences. There were not enough in depth study whereby inappropriate drainage canals were applied on shallow peat layers with underlying potential acid sulfate soil which results in the exposure of pyritic sediments. Today with the better understanding on tropical peatland and with better technology, the management peatland has improved. Canal systems with water gate and overflow based on topography information have successfully controlled water level and drain only surplus water. This particularly true for large concession of oil palm and pulp plantations in Riau which have been applying that technology.

Today, there are now about 14.9 million ha of peatland, 6.5 million ha of which have been altered for many purposes including agriculture. Actually, treating the peat marsh forests properly and correctly according to the peatlands capabilities/bearing capacity, will obtain proven better results. For example, in plantation development (mainly oil palm in some places in Riau and Jambi, with proper management, the obtained results are satisfied (average production can reach  $> 22 \text{ t TBS ha}^{-1}$ ). During peatland management in the field, the primary channels are built with the proper size according to the needs, which are used to supply fresh water and to remove excessive water (drainage). Groundwater level is mapped (on the range  $\geq 40 \text{ cm}$  during rainy season until  $\geq 80 \text{ cm}$  during dry season) and the channels are continually controlled tightly by making floodgate and runoff construction; secondary (collection drain) and primary (main drain) channels that were built are only to control the peat water level in the field. Similarly, the provision of macro-micro nutrients according to the needs of oil palm growth must be done in proper procedures.

In peatland management, groundwater level is always controlled in order to avoid peat fire. However, the problem is then come from abandon peatland which can continue to cause fire if there is no program of peat fire protection. There are now about 3.5 million ha of abandon peat that needs to be managed to prevent land fire (Wahyunto *et al.*, 2014). Restoration by rewetting is quite tricky since during long dry season water is insufficient to wet the abandon peat. Immature peat of the abandon peatland will not be able to hold water since the capillarity is very poor and this make the abandon peat prone to fire.

## **SOCIO-ECONOMIC ASPECTS OF PEATLAND CULTIVATION**

For provinces where peat is dominant such as Riau, Jambi, and South Sumatera, peatland plays a very important role in alleviating local farmers from poverty and at the same time brings economic benefit for larger community through multiplier effects. Rina dan Noorginayuwati (2013) identified that 90.6% of farmers on peatland (Kalimantan Tengah, Sulawesi Barat, and Riau) rely their live on agriculture. In Central Kalimantan, about 72% of local people living in this province, and farming on peatland is the main livelihood. Those facts indicate that peat for some people is a land that can produce food and money to survive. These lands help people from poverty and teach them to grow and develop culture. Oil palm is another example for local people to survive and to reach the so-called “welfare”. Palm oil farmer will have significant benefit since this palm is the most important vegetable oil in the world. For people living on peat, this land is the key to help them to be in the same degree with people from developed country. Herman *et al.* 2009 reported that farmers planting oil palm on peat will still have a significant economic benefit although the capital cost is still higher compared with oil palm on mineral soil.

For provinces, where peat is dominant soil type, there is not much choice except planting cash crop on peatland. The main homework here is that how peat can be well managed to prevent unexpected environment problems such as fire. Updated technology in water management system or peat compaction to maintain soil humidity should be applied to keep the plantation away from fire.

## **CONCLUSION**

For many years, peatland cultivation has provided a huge amount of experience for people from different education levels, background, and culture to learn that Indonesian peatland is unique and complex. This can not

only be seen as a single soil type that should be preserved, but since a time ago there have been many social, cultural, and economic activities on it since a long time ago which should also be considered. The critical issue now is how to bridge among social, economic, and environment purpose to address sustainable development. Constructive perception, better knowledge and tranquil inputs based on scientific evidences are needed to be further analyzed to build up an appropriate strategy for better future of Indonesian peatland.

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