Resilience, Rights and Resources: Two years of recovery In coastal zone Aceh

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Peat land along the coast of West Aceh

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Background

Tropical peat land constitutes peat formation in the tropical zone occurring in low-lying areas with excess moisture and high annual rainfall. Peal soils consist wholly or are dominated by organic material originating from forest vegetation. The tropical peatland is a unique natural resource potentially utilizable for variety of purposes. As a land resource, tropical peatland can be used for annual and perennial crop cultivation, for plantations and, to a lesser extent, aquaculture. Peat can also be utilized as growth substrate in nurseries and as pollutant adsorbent.

Tropical peatlands are an important resource providing numerous goods and products of importance for local communities and national economies such as timber, rattan herbs and medicinal plants and fauna of economic and conservation values. The peatlands also provide numerous environmental functions such as ecosystem maintenance, carbon storage, hydrological regulation and support for fisheries and biodiversity conservation. Peatland ecosystems are important for water resources conservation since their ability to store water is very high - up to eight times the dry weight of peat.

Sumatra still has 6.5 million hectare (mainly in eastern coast) of Indonesia's more than 16 million hectares. Tropical peatlands are subject to major impacts owing to land use change and fires. The increasing need for land, food, and fibre has led to clearance of large areas of peatland followed more often by inappropriate and unsustainable forms of peatland management resulting in degradation of the natural forest vegetation, lowering of peat water table, increase of peat surface and air temperatures and recurrent surface and ground fires. Consequently this leads to large emissions of carbon and smoke into the atmosphere.

Domes of peatland along the western coast of Aceh are evident (map). The peat domes such as those between the major rivers (Krung Meureubo and Krueng Bubon, Krueng Bubon and Krueng Woyla) are an important part the landscape along the western coast of Aceh. Most of these peat domes have been converted to rubber agroforests by farmers since many decades. The old rubber agroforests on the peat domes along the western coast of Indonesia are an important source of household income for the smallholder farmers and share tappers. These rubber agroforests were originally established from rubber seedlings and managed on low or no external input. Hence the latex productivity of these agroforests is relatively low although rubber tree density is high . Other products such as firewood and edible mushrooms are also extracted.

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Analysis of land cover data based on satellite image of the coastal zone of West Aceh for year 1990 shows a total of 99207 ha peat domes with rubber (out of approximately 1.08 million ha land in the imagery). Some conversion of peat dome rubber to other plantations and annual crops occurred between 1990 and 2002 at around 2864 ha per year (although conversion of natural forest to other land use alternatives was intense during the same period). Between 2002 and 2005, peat dome conversion intensified to 6568 ha per year (interestingly deforestation of forest areas was less intensive during this period, possibly due to intense political conflict and associated security problem). By 2005 only 45137 ha of peat domes with rubber remained (Figure 1).

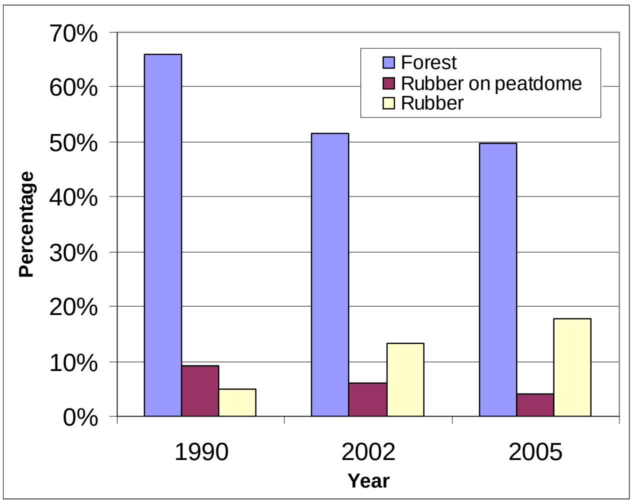

Figure 1. Proportion of forests, rubber on peat domes and rubber on mineral soils covered by satellite imagery for 1990, 2002, 2005 (area covered approximately 1.08 million ha land along the West Coast of Aceh).

Effects of Tsunami on peat soils and rubber agroforests

Lying low and close to the coast, the peat domes along the west coast of Aceh did not escape the tsunami waves and the following floods of sea water. The vegetation, including rubber trees, at the forefront of the waves were knocked over. The trees inside the agroforests survived the waves, possibly because of the barrier function of the frontal trees played in reducing the wave momentum. The saline water reached inland and flooded the area. Agriculture land and rubber agroforests on mineral soils were affected by salinity, depending on duration and height of water during the flooding time. The rubber agroforests on peat domes, however, seemed to survive as there was little infiltration of saline water through the peat soils primarily because these soils were already saturated with water when the floods occurred. Moreover, the acid property and high organic matter of the peat seemed to have neutralized the salinity effect.

The peat domes and rubber agroforests were damaged more by the post-tsunami relief and housing activities than by the tsunami itself. The relief operations following the tsunami consisted of clearing these peat domes for housing, agriculture land and road construction. Long drains were constructed to drain the peat soils. Evidence of imminent subsidence of peat soils is already emerging. Also construction of houses on peat soils resulted in these buildings leaning or falling over. Much resource has been wasted. Ecological damage is likely.

The maturity of the peat determines the maximum safe depth of water table in peat soil especially for annual crops utilization,. Although there has not been any systematic research on this connection, in general, for mature peat (sapric), the water table in the drainage system should be maintained at depth of 50 cm or less. For immature peat (hemist) the water table should be maintained no deeper than 30 cm to avoid over-drying and subsidence of the peat. For tree crops utilization, however, a deeper water table will be required.

The use of peat soils should be prioritized for crops that tolerate shallow water table. Rubber, oil palm and selected vegetable crop and rice can be cultivated on shallow (0-60 cm) to medium (60-140 cm) depth peat. The maturity of the peat also determines suitability. The mature peat (sapric) can be more readily cultivated and more suitable than the young (hemist) peat (see Wahyunto et al, this volume). Deep peat (> 300 cm depth) or peat dome, is strongly recommended to be undisturbed for conservation and water catchment functions.

Peat soil, especially immature and deep, is a vulnerable ecosystem. Its use must be limited so as not to cause serious detrimental effects to the environment. Care must be taken as far as development of the drainage systems, especially if the underlying mineral layer contains iron sulphate (pyrite) that forms sulphuric acid upon drying. Subsidence and erosion of dried peat can cause pyrite layer exposed to the surface making it more susceptible to oxidation process, Carbon emission is another environmental impact following peat drainage. Peat land of less than 3 m deep may be utilized for annual crops, but ensuring draining up to 0.5 cm depth. Tree crops probably needs deeper drainage.

Figure 2. Rubber agroforests in West Aceh - the gradient of tsunami damage from right (sea) to left (inland) is clear.

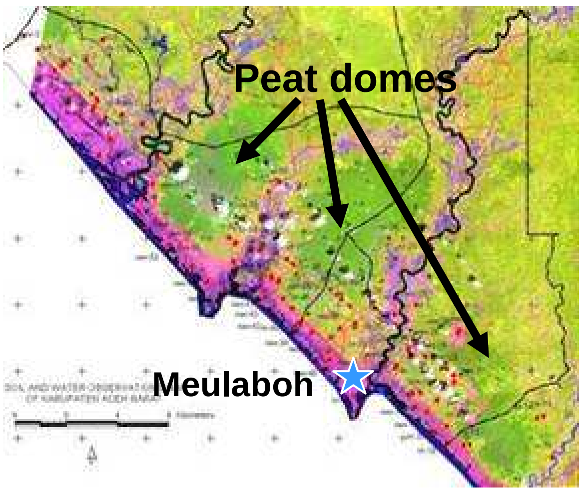

Figure 3. Peat domes in West Aceh.

Figure 4. Rubber agroforest on peat dome in Samatiga.

Figure 5. Rubber tree roots above ground – evidence of subsiding peat dome following drainage construction

Figure 6. Water level in peat domes is very high – here less than 1 meter below ground.

KEY MESSAGE

- Minimise disturbance and draining of peat land
- Adjust agricultural use of peat land to only suitable crops
- maintain water table under mature peat (sapric) at depth of less than 50 cm
- maintain water table under immature peat (hemist) at depth of less than 30 cm
- Deep peat (>3 m deep) and peat domes should not be disturbed as it is essential – no disturbance.

World Agroforestry Centre (ICRAF) is one of 15 organizations under the CGIAR (Consultative Group on International Agricultural Research) umbrella. ICRAF aims to stimulate and conduct innovative research, development and capacity building to promote and support agroforestry for both human and environmental benefits. ICRAF has its headquarters in Kenya and six regional offices in the tropics and now cover 21 countries in Africa, Asia and Latin America.
The research bulletins are summary results of collaborative activities of ICRAF and partners in the "Recovery and Resilience of Livelihood and Natural Resources", mainly in West Aceh, after the Tsunami of 26th December 2004. These bulletins were prepared, first in Indonesian language, for a workshop in Meulaboh on 30 November 2006. The primary objective was to share relevant result findings and observations among government and non-government organisations and individuals involved in the post-tsunami recovery in West Aceh. The workshop and preceding research activities were supported by Ford Foundation Indonesia, EU Asia Pro-Eco Program and CGIAR.

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