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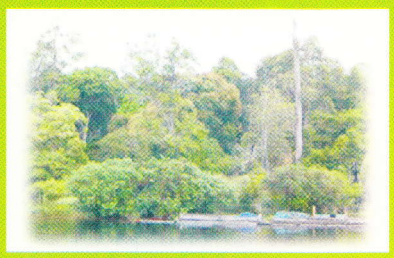

" WISE USE OF TROPICAL PEATLAND"

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UTILIZATION OF DEGRADED PEATLAND FOR PRODUCING BIOMASS AS SOURCE OF BIOENERGY AND COMPOST

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ABSTRACT

Peatland in Indonesia is recognized as the most important reservoir of plants and animals biodiversity and its exhibit a range of important ecological and natural resource functions. Natural vegetations at the peatland ecosystem are dominated by plants adapted with prolonged water lodge. Reclamation of peatland by canalization for making land suitable for many crops bring the areas become degraded land that characterized by very low pH and low nutrients for plants. Consequently, many areas are abandoned by farmers then only naturally adapted vegetations are grown. Eichhornia crassipes, Stenochlaena palustris, and Leptocarpus articulata are the most tolerance vegetations in degraded peatland ecosystem. These vegetations are produce biomass in a high growth rate, therefore, they proposed for producing biomass as source of bioenergy and compost as well.

Keywords : *compost, peatland ecosystem, vegetation*

INTRODUCTION

Natural peatland is recognized as the most important reservoirs of plants and animals biodiversity. Natural peatland is very importance environment that have a highly productive ecosystem with diverse flora and fauna. It also form a unique habitats for certain aquatic and hydrophyte plants. These plants in peatland system provide the basis for animal life, as well as conduct important hydrologic buffering and water purification functions (Stokes, 1939).

Reclamation of the peatland has become a priority of many authorities due to limitation of land for agricultural development. Peatland environments were regarded as wasteland that has possibility for conversion into agricultural or industrial lands. Peatland was reclaimed for industrial and agricultural development elsewhere in the world. Since 1980's, Indonesian government has done a great reclamation of large peatland in Sumatra and Kalimantan Islands. One of the biggest programs call "One Million Hectares Peatland Reclamation" in Central Kalimantan (Adhi, 1986). In the last mentioned program of peatland reclamation to agricultural land was failed and most of the lands become degraded lands.

The most important key for reclamation of peatland is water management. Water is the key to peatland maintenance, even though water levels fluctuate throughout the year. In order to make the peatland became suitable for many crops, the autorities built very long, wide, and deep

drainage canals. The reclamation without concerned to the forest conservation on the peat dome caused many ecosystem damage such as subsidence and very low pH until 2,5. In the lowest soil pH, the soil become very poor of nutrient and many toxic subtances invaded in high consentrate. In those condition, peatland become degraded and only limited adapted plants can grow (Hoag, 1994). The adapted plants that producing high biomass can be proposed as source of bioenergy and compost.

POTENTIAL PLANTS FOR BIOENERGY AND COMPOST

Peatland is characterized by water saturation in the root zone at or above the soil surface, for a certain amount of time during the year. The inundated or saturated conditions occurring an unique environment. Peatland is an important habitat for more than thousands kinds of flora both fauna (Adhi, 1986). Unwise utilization of peatland by human activity destroy peatland ecology become degraded peatland. The lands then abandoned by farmers. Abandoned peatland has low biodiversity, due to many varieties of flora and fauna died due to fires and unsuitable environment, and only certain varieties could survive. It is preferable only local adapted species that could survive in the limited condition.

Some adapted vegetations have good growth at degraded land. These vegetations have a highly tolerant with very low pH, flooding and insect invasion. Some vegetations also have a good tolerant to toxic substances, such as aluminium. Most of them can identified as water weeds (Hoag, 1994). The plants are *Eichhornia crassipes, Stenochlaena palustris,* and *Lepironia articulata Domin*. Those plants have a good adaptation with degraded land and have potential to produce biomass in high number. The description of the plant are as follows.

1. *Eichhornia crassipes*
   This plant has local name as Eceng Gondok, or water hyacinth. It is a kind of water weeds, and has many kinds of varieties. Eceng Gondok can grow in the range of pH 3.5 – 10.0 but the optimum at pH 4.5 – 7.0 This plant has growth and regenaration very rapid. In 8 mounths, it can be able to produce 600.000 new plants from only 10 main plants. Another observation told that this plant double in number and biomass every 6 to 15 days, and could yield 20 and 120 tons of dry biomass per year/ha. The rapid growth of this plant potential to produce biomass in high number. Eceng gondok known as accumulator plant. This plant could absorb toxic substances and heavy metals (Schrauf, *et. al*, 2005)
2. *Stenochlaena palustris,* in local name known as Kelakai. It is a rhizomatous and epiphytic perennial that commonly found growing in fresh water as well as in peat swamps area. The expanded leaves are used as a vegetable. This plant has a high growth rate and could covered large area.
3. *Lepironia articulata,* in local name known as Purun. It is a kind of herb water weeds that have high growth rate in soil that containing acid sulphate and high concentrate heavy metals. Life in asosiated, with close connected roots, this would produce a high biomass.

BIOMASS IN DEGRADED LAND AS SOURCE OF BIOENERGY AND COMPOST

In particular to reduce the needs of oils and gas as energy resource, any contribution are certainly needed to find the other potential energy resources. Biomass has great potential to provide renewable energy and going to be the largest domestic source of energy. Biomass has great potential to provide heat and power to industry and to provide feedstocks to make a wide range of chemicals and materials or bioproducts. In United States, the use of this kind of source of energy has provide over 3 percent of the total energy consumption (Perlack, *et. al.* 2004).

Bioenergy is made from materials derived from biological sources such as biomass. It is in a narrow sense a synonym to biofuel, which is fuel derived from biological sources. There is a slight tendency for the word *bioenergy* to be favoured in Europe compared with biofuel in North America. Bioenergy produced from organic matter. It's could be used directly as a fuel, processed into liquids and gasses, or be a residual of processing and conversion. Looking at the number of abandoned peatland in Indonesia, it is going to be a largest potential biomass sources. If we estimate that abandoned peatland could produce biomass 10 tons per hectare per year, a big biomass resources for bioenergy are available from degraded peatland.

Eichhornia crassipes, Stenochlaena palustris, and *Lepironia articulata Domin*, classified as weeds that have a rapid growth in the wetland. Biomass that produced from those plants can be used for compost after mixing with improving compost quality materials, such as cow dung, liming, urea, etc. The compost can be produce manualy by conventional composting or by machinery. The most important of making compost is preparing machine for destroying biomass.

All materials will oxidized to "compost", include *Eichhornia crassipes, Stenochlaena palustris,* and *Lepironia articulata Domin*. The compost can be use for rehabilitation of degraded land for planting horticultural plants as well as food crops, and plantations. Compost is the most important materials for improving soil properties.

Kaple (2009), told that the N, P, K content in *Eichhornia crassipes* compost generally 1,0%, 0,5 % and 1,0 %, respectively. Likewise the N, P, K values in the farmyard manure falls under 0,5-1,0%, 0,5% and 0,5-1,0% ranges, respectively. It is shown that water hyacinth compost is acceptable to be used in agricultural land for growing food crops and horticultural crops.

Relation to the use of accumulator plants, the chemical analysis of compost must be done. The results from the laboratory analyses help us to assess the compost likely benefits and potential risks for soil amendments. The concentration of toxicity materials or the presence of toxic elements can be used as compost quality.

CONCLUSIONS

Vegetation of *Eichhornia crassipes, Stenochlaena palustris,* and *Lepironia articulata* are included adapted plants at degraded peatland. These plants have a rapid growth and produce high biomass. The biomass can be used as source of bioenergy and compost. More analysis of compost in relation to the presence of toxic elements or substances should be done to assess the risk of compost application in the fields.

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