



PIONEER PLANT ADAPTATION AT THE POST COAL MINING RECLAMATION AREA IN EAST KALIMANTAN INDONESIA

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*Peer-review under responsibility of 3rd Asia International Multidisciplanry Conference 2019 editorial board
(<http://www.utm.my/asia/our-team/>)*

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RESEARCH HIGHLIGHTS

1. Coal mining activities change the environment physically, chemically and biologically that affect post-mining vegetation.
2. Reclamation and revegetation of post-coal mining land to restore the potential Kalimantan land as important production factor for crop cultivation.
3. The pioneer plant function was to help micro and macro ecosystems of post-coal mining environmental to be more stable. Kalimantan Island has many pioneering species, the most dominant is *Macaranga gigantea*, *Trema tomentosa*, *Alstonia scholaris*, *Croton argyrateus* and *Homalanthus populneus*.
4. Indicator of canopy growth to find out land cover creates a micro climate, fertility, input of forest plants and wild animal feed. *Homalanthus populneus*, *Trema tomentosa*, *Alstonia scholaris* show optimal canopy growth.
5. Three of the five pioneer species studied, *Alstonia scholaris*, *Homalanthus populneus*, *Croton argyrateus* has optimal growth. *Homalanthus populneus* is a pioneer that can adapt well in open areas, especially post-mining land.

Keywords: Revegetation; Adaptation; Pioneer Species; Mining Land.

RESEARCH OBJECTIVES

Environmental quality decrease is one of the coal mining activities impact in East Kalimantan (1). Open cast mining method which is used to extract the coal changes the soil stratification, reduced biotic diversity, and alteration of structure and functioning of ecosystem (2). The land becomes barren and critical, making it difficult for plants to grow and adapt, therefore post-mining area needs to be rehabilitated to restore the soil of the land as an important factor in crop cultivation (3). That means it will be returned to its natural and productive condition (4) by reclamation and revegetation. In the first three years after tree planting, the land condition will naturally be suitable to plant tropical trees. In East Kalimantan is a local tree that only can grow well under protective plants (intolerant tree) (5). Before being planted with local trees, the environmental conditions must be suitable for seedlings to plant a local tree by planting a pioneer plant first. One of the pioneer plant functions is to stabilize the macro and micro ecosystem condition around the post-mining land area. This study was to determine pioneer species that can adapt to the post-coal mining environment in East Kalimantan.

MATERIALS AND METHODS

The study was conducted at a mining location in East Kutai District in 2018. The tools used in this study are hoes, rulers, micro-calipers, machetes, scissors, stationery, while the materials used are from 5 selected pioneer plant species, namely *Macaranga gigantea*, *Trema tomentosa*, *Alstonia scholaris*, *Croton argyrateus* and *Homalanthus populneus*. Other materials used to support research is NPK fertilizer. The research starts by field orientation, seedling preparation, land preparation, planting and every month measurement. The data collected is the plant life percentage, plant height, stem diameter and crown diameter. The seedlings planted are three-month-old seeds with uniform conditions, while preparing post-mining that has been planted with cover crops and leguminous species. This study used in a completely randomized block design (RCBD). 15 plots of 30 x 25 m size for five pioneer tree species were used. The data of plant species were processed to calculate the plant life percentages (%), stem diameter measurement results (cm), crown diameter measurement results (cm), plant height





measurement results (cm), data analysis by ANOVA, and if the \ results is significantly different, then to find out the best treatment, use a further test with the smallest real difference test (LSD).

RESULTS

The plant life percentage at a month of the various pioneer species studied showed overall plants grow well. The average life percentage at a month is 93.15%. The criteria of planting success are based on the following criteria; failed (<9%), low (10-39%), sufficient (40-69%) and good (70-100%). Based on these criteria, all plants studied had a percentage of life with good criteria (> 70%). The plant height at a month ages shown an average plant height has good height increase (40.97 cm). The best height-growth plant is *Trema tomentosa* (50.75 cm) and the lowest is *Macaranga gigantea* (30.25 cm). The plant stem diameter were 0.52 cm with the lowest value was *Macaranga gigantea* (0.45 cm) and the highest was *Homalanthus populneus* (0.60 cm). *Homalanthus populneus* is a pioneer plant species that grows in logged-over forests, secondary forests and riverbank forests, in the lowlands to approximately 2000 meters asl. The pioneer plants showed good growth of canopy diameter i.e., *Homalanthus populneus* and *Trema tomentosa*. While the commercial pioneer tree species was *Alstonia scholaris*. *Trema tomentosa* has an ability to generative growth fast, it can be one of the considerations for land rehabilitation and reclamation in a high brackish animal population area.

FINDINGS

Study of five pioneer plants species showed three species with optimal growth, i.e., *Alstonia scholaris*, *Homalanthus populneus* and *Croton argyratus*. Based on the 5% level LSD test result, the life percentage of *Alstonia scholaris* and *Croton argyratus* is not significantly different to *Homalanthus populneus*. But it is very different with *Macaranga gigantea* and *Trema tomentosa*. *Homalanthus populneus* is the most adaptable pioneer plant species in open places, it's grows in the open post-mining area and in a forests with still intact condition. In general, plant adaptation and growth is influence by land factors and the genetic characteristics of existing plants.

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