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Analysis Of Biomass On Reclamation Area Of Ex-Coal Mining Ptba Ombilin, Sawahlunto City, 1991 And 2001 Planting Year

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Abstract – PT Bukit Asam Ombilin is one of the coal mines operatingin Indonesia and located in Sawahlunto City, West Sumatra Province. In carrying out its operations, PT BA Ombilin conducts a reclamation program on lands that are no longer disturbed by mining activities. The reclamation program is intended to restore forest conditions similar to the initial conditions and avoid erosion. In addition to this, of course, reclaimed forest also has a function as a store of carbon reserves. Carbon in plants is stored in the form of biomass. This study aims to measure the biomass content contained in the reclamation area of the former coal mine of PTBA Ombilin Sawahlunto City in 1991 and 2001 planting year. root. Measurement of litter and understorey biomass using the destructive sampling method. Making plots for laying samples using the transect method. The measured biomass components were stem diameter and height. The results of this study found that in the reclamation area of the 1991 planting year, there were 13 species in 7 families and 101 individuals with a total biomass of 134,187 tons/ha. Meanwhile, in the reclamation area in 2001, there were 10 species found in 9 families and 80 individuals with a biomass value of 108.11 tons/ha so that the total biomass in the reclamation area was 30 ha with a total area of 242.297 tons/ha. The results of this study found that in the reclamation area of the 1991 planting year, there were 13 species in 7 families and 101 individuals with a total biomass of 134,187 tons/ha. Meanwhile, in the reclamation area in 2001, there were 10 species found in 9 families and 80 individuals with a biomass value of 108.11 tons/ha so that the total biomass in the reclamation area was 30 ha with a total area of 242.297 tons/ha. The results of this study found that in the reclamation area of the 1991 planting year, there were 13 species in 7 families and 101 individuals with a total biomass of 134,187 tons/ha. Meanwhile, in the reclamation area in 2001, there were 10 species found in 9 families and 80 individuals with a biomass value of 108.11 tons/ha so that the total biomass in the reclamation area was 30 ha with a total area of 242.297 tons/ha.

Keywords – Coal, Biomass, Mining, Reclamation.

I. INTRODUCTION

Approximately 90% of the biomass is found in forests in the form of trees, branches, leaves, roots and litter (Arief, 2005).Forest damage in Indonesia has reached approximately 50% (59.62 million/ha) and will continue to increase by 2.8 million ha/year. Significantly reduce the source of carbon stored in forest biomass released into the atmosphere and the ability of the earth to absorb CO2 from the air through forest photosynthesis is reduced (Ministry of Forestry, 2006).

Biomass can stimulate carbon absorption through photosynthesis and carbon removal through respiration. The net carbon sequestration is stored in plant organs. Biomass functions and models are represented by equations with tree height and diameter (Kun and Dongseng, 2008). Increasing carbon stocks can be done by increasing the growth of forest biomass. Mining companies also indirectly increase carbon stocks through post-mining land reclamation activities. Reclamation is the restoration of productivity on a degraded land.

One of the branches of PT BA is located in Sawahlunto City, which is known as PT BA Ombilin Tbk, Sawahlunto City. Based on the land cover map, the coal mining reclamation area has an area of 40,000 m2 or 40 Ha. PT Bukit Asam Tbk Ombilin

Kandi area carried out a reclamation program starting in 1991-2001. The reclamation area is ± 20 years old. It is suspected that the reclamation area of ex-coal mining land can contribute to global climate change mitigation efforts. Therefore, it is necessary to conduct research on the analysis of biomass in the reclamation area of the PTBA Tbk Ombilin coal mine, Sawahlunto City.

II. Research Methods

This research was carried out from April to June 2021 in the reclamation area of the coal mine of PT Bukit Asam Tbk Ombilin, Sawahlunto City. Data identification and analysis were carried out at the Ecology Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Andalas University.The reclamation area of the coal mine of PT Bukit Asam Tbk Ombilin Sawahlunto City in 1991 is located between 100044'48.93" East Longitude to 100044'50.03" East Longitude and 0037'38.91" South Latitude to 0037'44.48" South Latitude.The tools used in this research are DBH meter, meter, GPS, work map, compass, camera, thermometer, identification book, crop shears, stake, rope, plastic, paralon, tally sheet, oven, stationery, hoe, analytical scale .

Field data collection was carried out by systematically plotting sample plots (left and right) of transects measuring 10 mx 10 m along 100m. Tree level data collection (dbh 10 cm) was carried out on a 10 x 10 meter plot at each location of the ex-coal land reclamation area of PT Bukit Asam Tbk Ombilin, Sawahlunto City. (Fachrul, 2012).

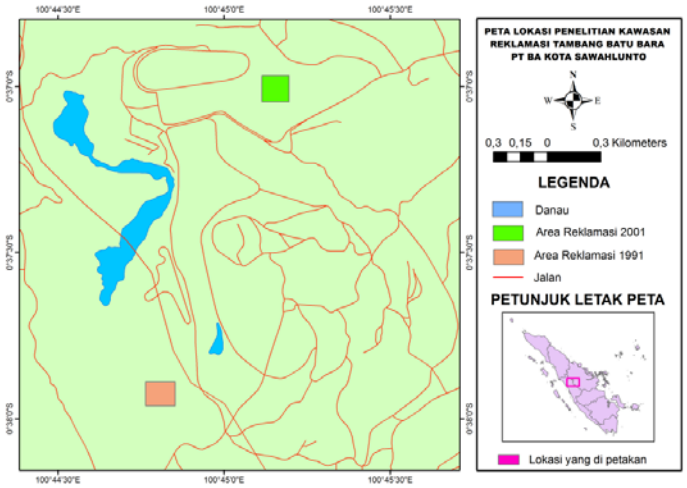


Figure 1. Research Location

Measurement of tree biomass and sampling was done by taking the diameter of the trunk, height, and identification of tree species. Calculation of tree and pole biomass using the biomass allometric equation as follows:

No	tree type	Allometric Equation	Source
1	*Acicia mangium*	W = 0.000328 x D2.2764	Haruni et al. (2012)
2	*Paraserianthes falcataria*	W = 0.148 x D 2.299	Haruni et al. (2012)
3	*Cassia siamea*	W = 0.0559 x 0.6 x D2 x H	Chave (2005)
4	Other Kinds	W = 0.0559 xpx D2 x H	

Measurement of litter and understorey biomass was measured by collecting litter and understorey and then weighing the total wet weight (kg). Then the undergrowth and litter were each taken as much as ±300 grams of samples as the wet weight of the sample. The samples were then placed in an oven at 85oC to obtain a constant dry weight (Hairiah and Rahayu, 2007).

III. DATA ANALYSIS

1. Tree Biomass and Sapling

$$\text{Total biomass} = AGB1 + AGB2 + ... AGBn$$

Description :

AGB = Above ground biomass

2. Litter and Understorey Biomass

$$\text{Total Biomass (kg)} = \frac{BKc \text{ X } BBt}{BBc(kg)}$$

3. Dead Tree Biomass

$$\text{Total Biomass} = AGB \text{ x Correction factor}$$

4. Root Biomass

$$Bbp = NAP \text{ X } Bap$$

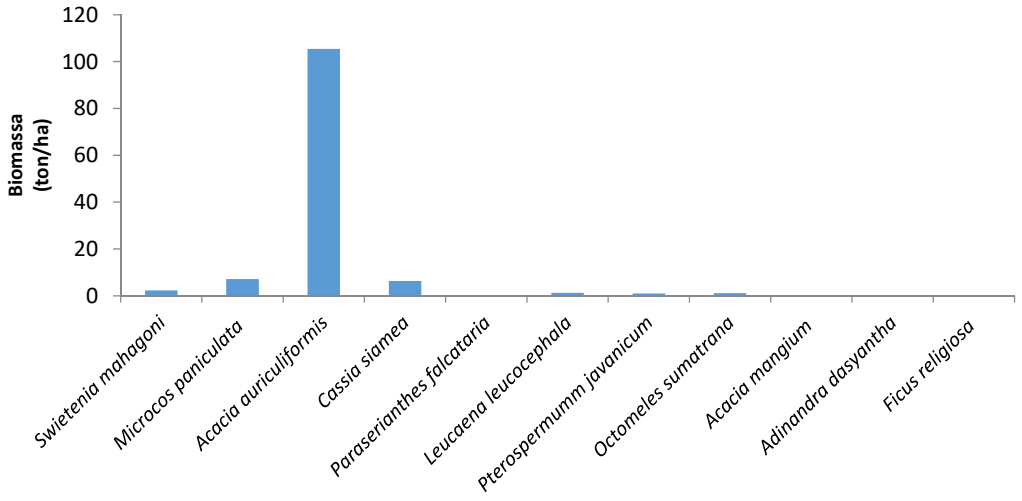
IV. RESEARCH RESULT

Based on the research that has been done, the following results are obtained

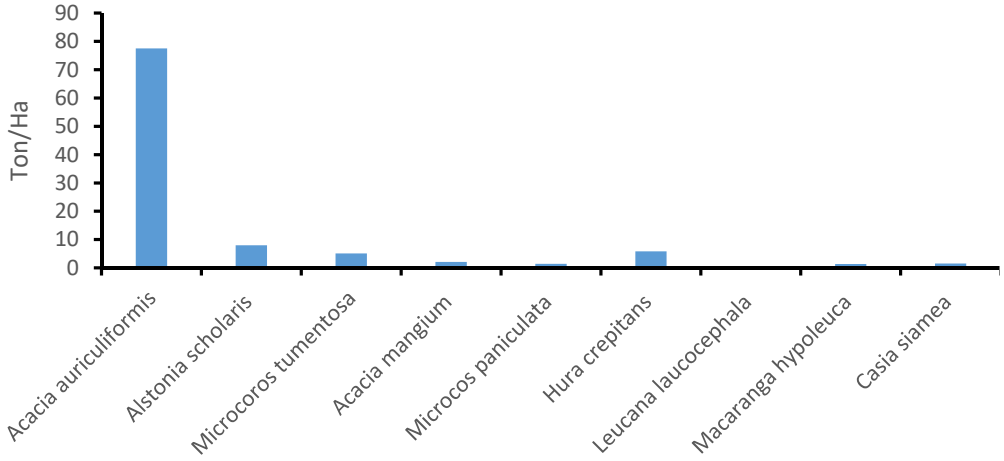
1. Tree Biomass

Based on research that has been carried out in the PTBA Ombilin Coal reclamation area, Sawahlunto City in 1991, it was found that there were 78 individuals consisting of 13 species and 7 families. The tree-level biomass content in the 1991 Planting Year showed that the Acasia auriculiformis species was 105.43 tons/ha. Then followed by Microcos paniculata with a biomass value of 7.15 tons/ha.Meanwhile, biomass at the tree level in the reclamation area of former coal mines in 1991 PTBA Ombilin, Sawahlunto City, was in the Hura crepitans species at 0.26 tons/ha (Graph 1).

Meanwhile, in the reclamation area of the 2001 Planting Year, 9 species were found in 4 families with a total of 30 individuals.The highest biomass content in the reclamation area of ex-coal mining is the highest type of Acacia auriculiformis at 77.52 tons/ha. Furthermore, the type of Alstonia scholaris has a biomass value of 7.98 tons/ha and is followed by the type of Hura crepitans of 5.85 tons/ha. Meanwhile, the species with the lowest biomass value was Leucana laucocephala from the Fabaceae family at 0.47 tons/ha (Graph 2).



Graph 1. Tree Level Biomass in Land Reclamation Area of Former PTBA Ombilin Coal Mine Planting Year 1991

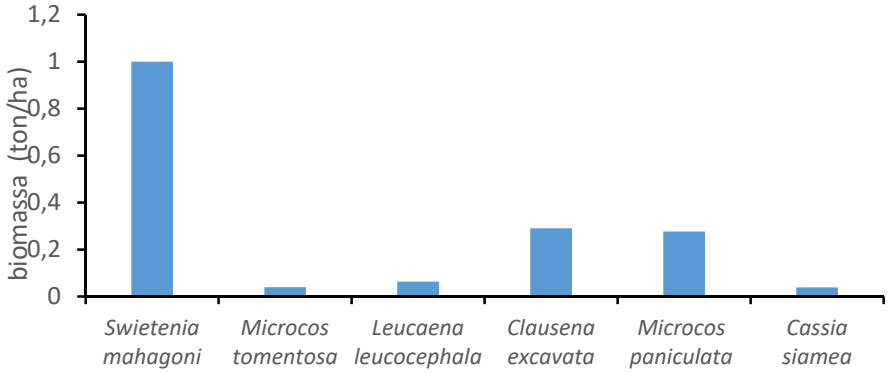


Graph 2. Tree Level Biomass in Land Reclamation Area of Ex-PTBA Ombilin Coal Mine Planting Year 2001

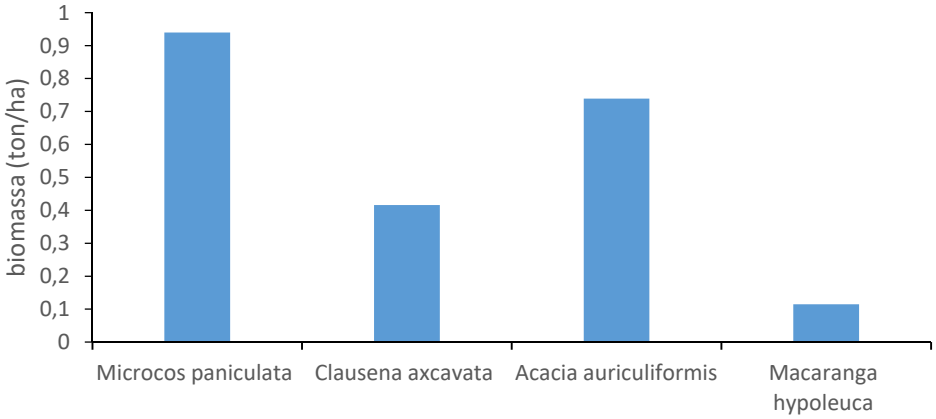
2. Sapling Biomass

Based on research conducted on the reclamation area in 1991 of the former coal mine of PTBA Ombilin, it is known that there are 32 individuals consisting of 4 families and 6 species. The highest biomass content was in Swietenia mahagoni, which was 0.999 tons/ha. In addition, the Clausena excavata species has a biomass of 0.29 tons/ha. Meanwhile, the lowest biomass and carbon stocks were in the 2001 Planting Year reclamation area of former coal mine PTBA Ombilin Sawahlunto city, namely Cassia siamea at 0.03 ton/ha (Graph 3). The high biomass value of Swietenia mahagoni is because it has a larger diameter when compared to other types.

Meanwhile, in the 2001 Planting Year reclamation area, there were 51 individuals consisting of:of 4 families and 4 species. The highest biomass content is*Microcos paniculata*from the Malvaceae family of 0.93 tons/ha. Type*Macaranga hypoleuca has the lowest biomass* contentnamely 0.11 ton/ha (Graph 4). The high value of biomass and carbon stocks of Microcos paniculata is caused by having a higher average diameter compared to other types, which is 7.18 cm. Meanwhile, Macaranga hypoleuca has a lower average diameter of 3.26 cm.



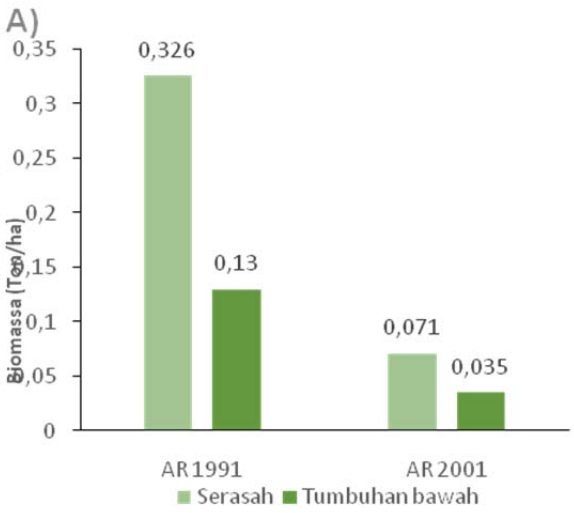
Graph 3. Biomass Sapling Level in Land Reclamation Area of Ex-PTBA Ombilin Coal Mine Planting Year 1991



Graph 4. Biomass Sapling Level in Land Reclamation Area of Ex-PTBA Ombilin Coal Mine Planting Year 2001

3. Litter and Understorey Biomass

Based on research that has been carried out on plots measuring 2 x 2 m for the measurement of litter and understorey biomass, the results show that the litter biomass value is higher than that of understorey biomass (Graph 5).

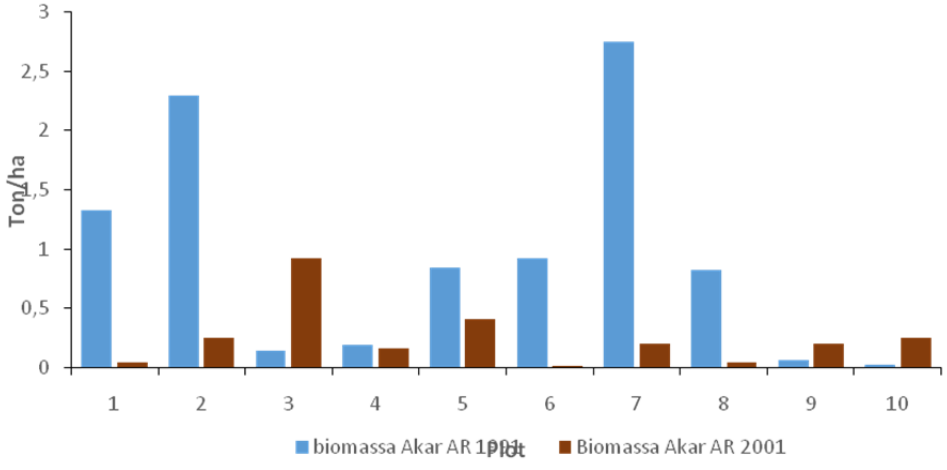


Graph 5. Litter and Undergrowth Biomass

In the reclamation area in 1991, the litter biomass value was higher than the reclamation area in 2001, which was 0.326 ton/ha. Meanwhile, the biomass value in the reclamation area in 2001 was 0.071 ton/ha. TThe high value of biomass and the reclamation area in 1991 was caused by the dense tree canopy at the research location, which inhibited the growth of understorey but increased litter production. The low value of understorey biomass in the 2001 reclamation area, the lack of sunlight entering the forest floor, thus inhibiting the growth of understorey.

4. Root Biomass

Based on the research that has been carried out, it was found that the highest root biomass value of the ex-coal mining area of PTBA Ombilin, Sawahlunto City in 1991 was found in plot 7, plot 2 and plot 1 which are presented in Graph 6.The highest root biomass was in the 1991 reclamation area of 2,745 tons/ha located in plot 7. Besides that, plot 2 also had a high biomass value of 2.28 tons/ha and plot 1 had a biomass value of 1.32 tons/ha. Meanwhile, the lowest root biomass was in plot 10 with a biomass value of 0.0243 ton/ha. Meanwhile, in the reclamation area of 2001 Planting Year, the highest biomass was in plot 3 of 0.915 tons/ha and plot 5 of 0.403 tons/ha.The high value of root biomass in this plot is due to the fact that the above-ground biomass value is higher when compared to other plots. On the other hand, the low root biomass value in the 2001 reclamation area was influenced by the low aboveground biomass value.



Graph 6. Root Biomass in the former PTBA Ombilin coal mine reclamation area

V. DISCUSSION

The high content of tree biomass and sapling in the reclamation area of former coal mine PT BA Ombilin in 1991 was due to this tree species having a larger average diameter when compared to other types. Likewise, the reclamation area of the ex-coal mine PT BA Ombilin 2001 Planting Year with the same type has the highest biomass content. Diameter is a factor that affects the biomass content. This is in accordance with the almetric equations of Chave et al. (2005) to calculate the high and low value of tree biomass is influenced by diameter and specific gravity. The higher the diameter of a tree, the higher the biomass content. Vice versa, the smaller the biomass content.

Biomass of litter is higher when compared to undergrowth. This is due to the dense canopy cover that inhibits the growth of undergrowth. This is in line with the opinion of Budiman, Hardiansyah Darwati (2015) which states:The factor causing the amount of litter that varies in general is due to the addition of litter biomass along with the increase in canopy density. Canopy density is one of the factors that affect the fall of forest litter due to competition for sunlight. The denser a canopy will produce a large amount of litter. Factors that cause high or low root biomass content are due to the high value of above-ground biomass. The higher the above-ground biomass value in an area, the higher the root biomass content.

VI. CONCLUSION

Based on the research that has been done, the total biomass is 134,187 tons/ha. Meanwhile, in the reclamation area in 2001, there were 10 species found in 9 families and 80 individuals with a biomass value of 108.11 tons/ha so that the total biomass in the reclamation area was 30 ha with a total area of 242.297 tons/ha.

VII. AKNOWLEDGMENT

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