PLANT DYNAMICS AND GROWTH IN FOREST AND LAND REHABILITATION ACTIVITIES IN MENAMANG VILLAGE, MUARA KAMAN DISTRICT, KUTAI KARTENEGARA REGENCY, INDONESIA

ABSTRACT

This research was conducted in the planting area of PT Kideco Jaya Agung, Muara Kaman District, KutaiKartanegara Regency, East Kalimantan Province. The aim was to evaluate the growth success of plants planted 1 (one) year old. 2.5 hectares, plots are placed systematically representing a 25-hectare crop with a distance of 100 m between the centres of the plots. The results of research that has been done on 25 plots are 1830 plants with an average of 74 plants, and the average percentage of growth is 96.44%. The quality of plant growth is classified into 3 categories: healthy, languishing, and dead plants. Size plot 12 is the plot that has the worst plant conditions among the others, while the plot that has the best crop conditions is plot 19. The plot with the highest plant height is plot 20, with an average plant height of 76.98cm. In contrast, the plot with the lowest plant height was plot 7, with an average plant height of 68.01 cm. Overall, the average plant height is good, namely 73.84 cm.

Keywords: Percentage of Growth, Quality of Plant Growth, Plant Height

1. INTRODUCTION

Restoration and rehabilitation have become an integral part of forest management in the tropics and temperate climates. But it is becoming very important in tropical forest management because of forests' increasing destruction and degradation [1].

Forest and Land Rehabilitation activities that have been carried out must be monitored continuously so that the plants that have been planted can grow properly. Of course, if the success is less than the predetermined target, plant replanting will be carried out so that the target for the success of the plants is still achieved.

Reported results [2} show that natural succession is the main forest restoration process in degraded land in Hong Kong. Without fires and other disturbances, all potentially degraded land can be restored to closed secondary forests within 30–40 years. Reforestation can facilitate forest formation, but the ecological function of most plantations is generally weak because most of the species planted are fast-growing exotic plants. However, the diversity of plantation flora increases with age by invasion and the establishment of native species. Fire is a major limiting factor for secondary forest and plantation development. Forest rehabilitation in degraded areas can be greatly accelerated if fires are controlled efficiently.

Research results reported [3] that forest cover in Vietnam has increased dramatically over the past 30 years, largely driven by plantations of exotic tree species. The potential to utilize Vietnam's diverse native flora in reforestation is largely lacking. Explored. At two sites in northwestern Vietnam, Na Bai-Leo and Na

Noi, experimental forest rehabilitation were done using dispersed planting on marginal agricultural land and enrichment planting in degraded natural forests. There is great potential to rehabilitate Vietnam's vast marginal agricultural lands and degraded forests by planting native species. Communities were very enthusiastic about getting involved in forest rehabilitation – the main obstacle to involvement was resources (e.g. provision of seedlings, tree planting training). Projects such as this one provide a way to overcome initial resource constraints, increase knowledge about native species and forests, and increase awareness of and management techniques for degraded forests, marginal agricultural lands, and native species.

Borrow-to-use Forest Area Permit, abbreviated as IPPKH, is a permit granted to use a forest area for development purposes other than forestry activities that have strategic objectives and cannot be circumvented without changing the function and allotment of forest areas [4]. PT. Kideco Jaya Agung as the holder of a Borrow-to-Use Forest Area Permit (IPPKH), has carried out Forest and Land Rehabilitation activities in the KutaiKartanegera National Park area, which is included in MenamangKanan Village, Muara Kaman District, KutaiKartanegera Regency, East Kalimantan Province.

To determine the success rate of Forest and Land Rehabilitation, reduce the risk of failure, or increase the success rate, various processes of management activities are needed, one of which is an analysis of the success rate of intensive pattern planting activities for Forest and Land Rehabilitation [5].

This research aims to evaluate plant growth and whether the plants grow well or need to be replanted so that the planting target will be achieved properly.

2. MATERIAL AND METHOD

This research was conducted in MenamangKanan Village, Muara Kaman District, KutaiKartanegara Regency, East Kalimantan Province, which is in the Kutai National Park Area. The time for conducting the research is for 2 months, namely in August and September 2022

The tools and materials used in this study included Global Positioning System (GPS), Compass, Meter, Plot boundary marking tape, Camera for documentation when data collection, and Laptops for data processing and research report writing.

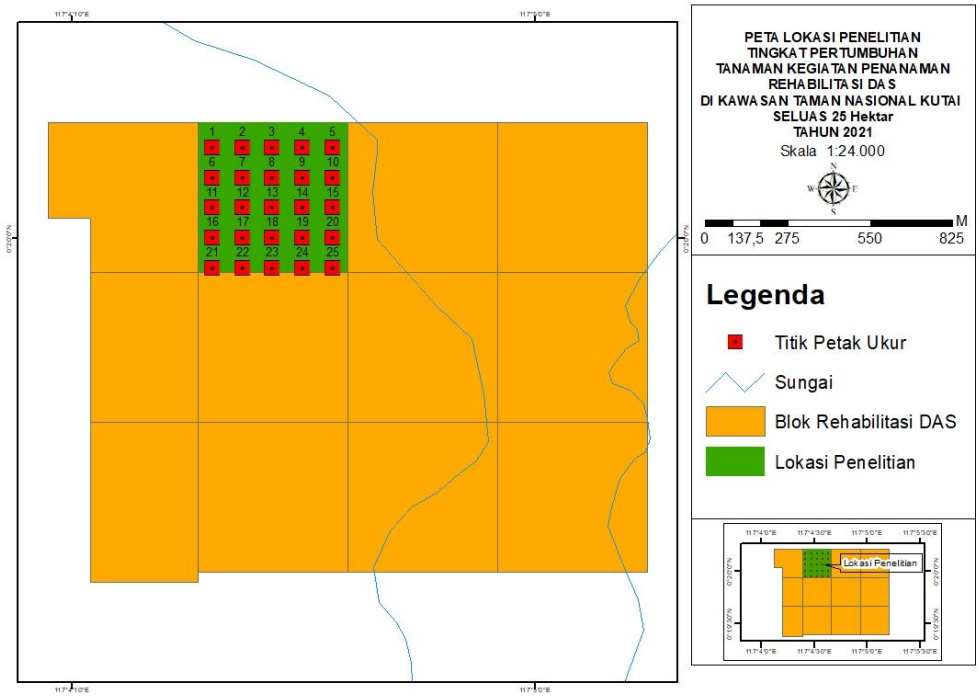

Figure 1.Research PlotsSource: Field Survey (August 2022)

Research Limitations, This study focused on planting plots of 29 block 2 blocks located at coordinates 117°4' 47.893" East Longitude and 0°20' 4.484" North Latitude in the Kutai National Park Area, MenamangKanan Village, Muara Kaman District, KutaiKartanegara Regency, Province East Kalimantan, which PT manages. Kideco Jaya Agung as the holder of a Borrow-to-Use Forest Area Permit (IPPKH)

The data collection method uses Systematic Sampling Witha Random Start method, in which the first sample plot is randomly generated, and subsequent sample plots are created systematically [6], with a plot size of 40m x 25m, a total of 100 plots or 2. 5 ha, or with an IS sampling intensity of 10%, the plant spacing is 4m x 4m, so the number of plants is 625 stems/hectare

The distance between the centre points of the sample plots is 100 meters north-south and 100 m west-east; the number of plots is 2.5 / 0.1 = 25, so the number of samples or plots in this study is 25 plots. With a spacing of 4m x 4m and an area of 25 hectares, the number of plants per hectare is 625 stems/hectare,and the total number of plants planted in an area of 25 hectares is 15,625. There are 63 plants in 1 plot measuring 40m x 25m, so the number of plants in 25 plots is 1,575.

Plant height is the average plant height obtained by measuring the height of each plant in the sample plots and then averaging.

The data that has been collected is then processed using the formula for the percentage of plant growth, the percentage of healthy plants, the percentage of languishing plants, and plant height.

2.1. Plant Growth Percentage

The percentage of plant growth is calculated by comparing the plants that grow with the number of plants determined in a plot. To measure the percentage of living plants, use the formula according to [7] as follows:

Percentage of plants grown (%)=(Number of plants grown)/(Number of plants planted) x 100%

Criteria used:

> 75% = the percentage of plants growing well
51% - 75% = the percentage of plants growing poorly
26% - 50% = the percentage of plants growing rather well
0% - 25% = percentage of plants growing poorly

2.2. A healthy quality of life

Observation of the quality of life of plants observed from their growth, namely living healthy plants, languishing plants, and dead plants.Healthy live plants grow fresh; the stems are relatively straight, densely crowned with a minimum height according to standards, and free from pests and diseases.

Percentage of live plants (%)=(Number of live plants)/(Number of plants planted) x 100%

Criteria used:

> 75% = percentage of healthy live plants
51% - 75% = the percentage of live plants is not good
26% - 50% = the percentage of living plants is rather good
0% - 25% = percentage of bad live plants

2.3. Plants grow abnormally

Plants grow abnormally or are attacked by pests and diseases, so if cared for, they will unlikely grow healthy.

Percentage of miserable plants (%)=(Number of miserable plants)/(Number of plants planted) x 100%

Criteria used:

> 75% = very high percentage of wasting plants
51% - 75% = the percentage of plants is high
26% - 50% = the percentage of plants is low
0% - 25% = the percentage of plants is very low

2.4. Dead plants

Dead plants cannot grow anymore and are characterized by stems, leaves, and twigs drying out until they eventually die.

Percentage of dead plants (%)=(Number of dead plants)/(Number of plants planted) x 100%

Criteria used:

> 75% = very high percentage of dead plants
51% - 75% = high percentage of dead plants
26% - 50% = low percentage of dead plants
0% - 25% = very low percentage of dead plants

2.5. Plant height

Plant height is the average plant height obtained by averaging the height of each plant. Plant height was measured using a measuring stick, namely a measuring stick. Plants are measured by holding the tool perpendicular to the horizontal plane at eye level. Then the eye shoots at a marked distance.

3. RESULTS AND DISCUSSION

3.1. Planting

During the activity, the direction of the run is carried out at the same time as clearing bushes and reeds. Making the direction of the run is done by considering the direction of the path and the spacing. In making the direction of the run, the path of the plants is marked with stakes in the direction of the run and given red paint, where the distance between the stakes in the direction of the run reflects the planting distance. In planting a lane system, making plant paths also consider the direction of the sun's rays. Plant paths are made in a north-south direction so that the plants get enough sunlight for their growth. The types planted are mixed types, namely Cempedak (*Arthocapus integer*), Red Meranti (*Shorealeprosulla*), Gaharu (Aquilariamalacensis), Rambai(Baccaureamotleyana), Lime (*Dryobalanopsaromatica*), Guava (*Syzygium*sp) and Laban (*Vitexpubescens*)

Clearing the land from shrubs and weeds aims to free plants from weeds or weeds. Planting was carried out using a lane system in relatively flat topography, such as the plots in this study. Land clearing for planting in the lane system was carried out by slashing shrubs and weeds along the paths with a width of ± 1 meter.

3.2. Percentage of Growing Plants

The results of observations of Forest and Land Rehabilitation plants that have been carried out in block planting plots of 29 plots 2 in the Kutai National Park area, MenamangKanan Village, Muara Kaman District, KutaiKartanegra Regency, East Kalimantan Province, which should have been planted with a spacing of 4x4m, but the planting distances in the field were used is 3 x 3 m. The number of plants in one plot with an area of 40 x 25 m is 63, totalling 25 plots. However, the reality on the ground is that the number of plants planted varies, ranging from 62 plants to 101 plants.

Percentage plant growth is calculated by comparing the number of plants in a plot with the number of plants planted in the plot. The percentage yield of plant growth for each measuring plot can be seen in Figure 2.

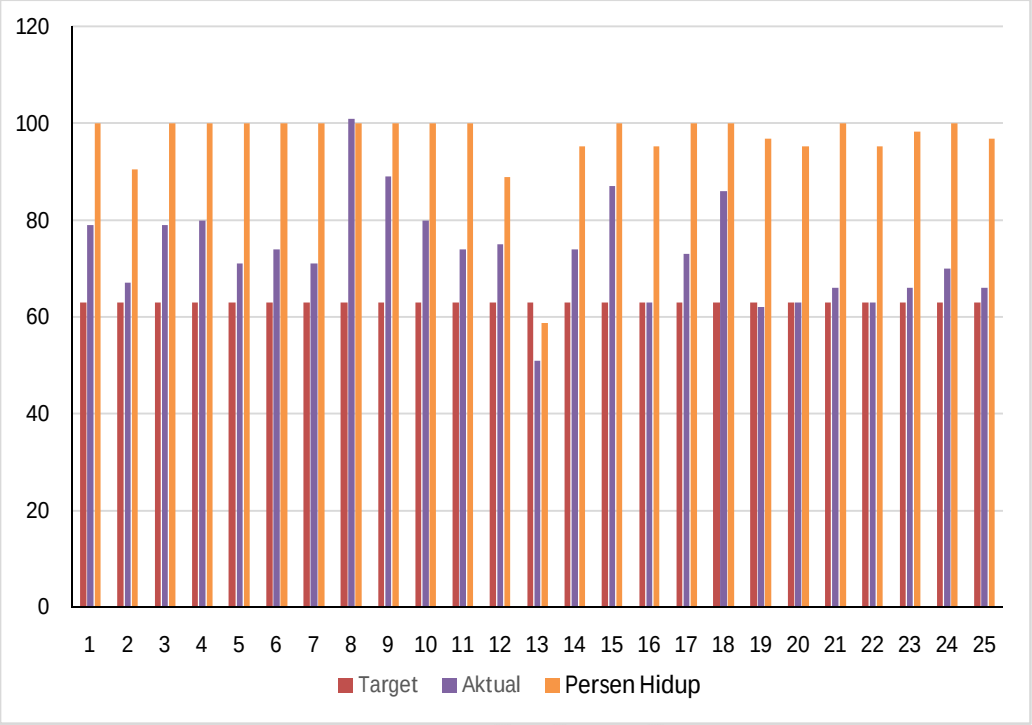

Figure 2. Percentage of Plant Growth (Source: Result of Data Processing, 2022)

Based on the graph shown in Figure 2, it is known that the plot with the least number of plants is plot 13, with a total of 51 plants and a growth percentage of 58.73%. This was because many of the plants in the 13 plots died. Meanwhile, plot 8 had the highest number of plants, namely 101 plants, with a growth percentage of 100%. In this plot, the plants planted exceeded the target, so the success of growing in this plot was the best.

The number of plants that should be in the 25 plots is 1,575 plants, with an average plant per plot of 63 plants. However, the number of plants in the 25 plots was 1,830, with an average of 74 plants, and the average growth percentage of the 25 plots was 96%. So that the percentage of plant growth for Forest and Land Rehabilitation (RHL) activities in MenamangKanan, KutaiKartanegara Regency, is 96%.

These results indicate that the implementation of planting activities in the first year, namely the age of 1 (one) year, produces a good growth percentage because the growth percentage exceeds 70%, as stated by [8] that the percentage of plant growth is declared successful if $\geq 70\%$ and declared less successful if $\leq 70\%$. The success of planting plants for rehabilitation of the land, aside from the fact that the location of the planting area is an area that is quite friendly to plants, both in terms of relatively fertile soil, on the left and right of the plants, there is still shade from the surrounding plants and also supported by good weather for plant growth, i.e., when viewed from the rainfall which is sufficient to wet the plant area, this is indicated by the state of monthly

rainfall during 2022 [5which is 163 mm3 with the number of rainy days per month is 11 days in other words that every 3 rainy days. This is what makes plants able to survive and grow well. As stated by [9], as part of site characterization, basic data on the rehabilitation area, including topography, altitude above sea level, soil type, and fertility, is very important because it is this data that determines the species that are suitable for the species. Ecology for an area.

3.3. Plant Quality Conditions

Observation of the quality of plant growth from its growth, namely healthy, languishing, and dead plants. Conditions for healthy plants are plants that grow fresh, and stems are relatively straight, densely crowned with a minimum height of ≥ 50 cm, and free from pests and diseases. The condition of miserable plants is plants that grow abnormally or are attacked by pests and diseases so that if they are cared for, they are less likely to grow well. The condition of a dead plant is a plant that cannot grow anymore and is characterized by stems, leaves, and twigs drying out until they finally die. Figure 2 shows the percentage of healthy plant conditions obtained from calculating the number of healthy living plants divided by the number of plants planted. Likewise, with the calculation of plants languishing and dead plants.

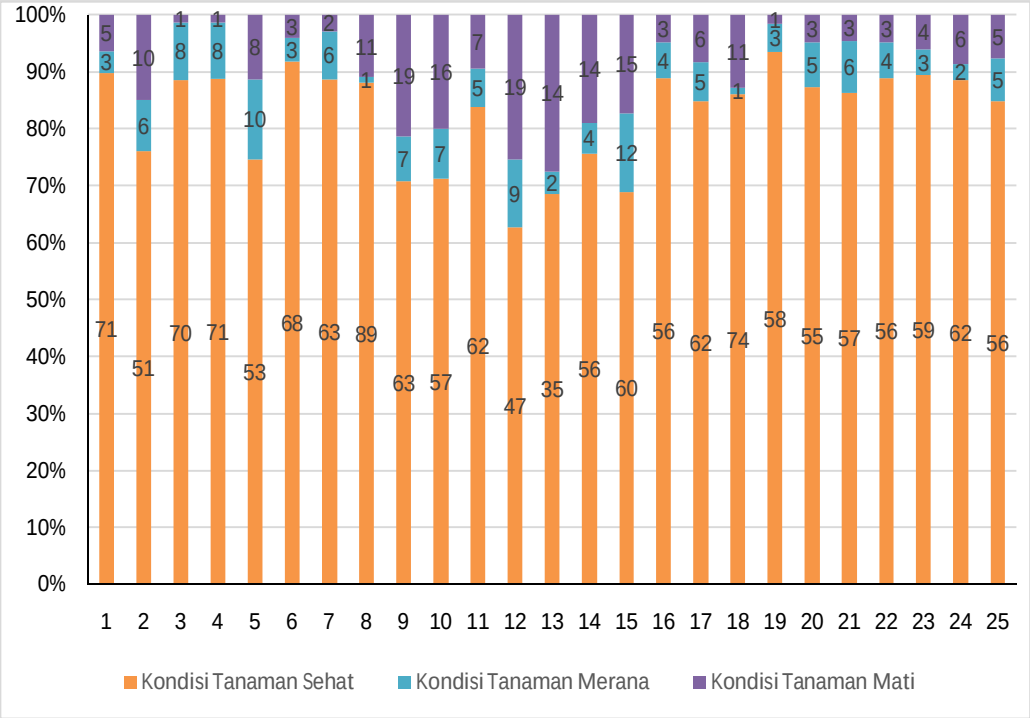

Figure 3. Percentage of Plant Living Conditions (Source: Result of Data Processing, 2022)

In Figure 3, it can be seen that Plot 12 is the plot that has the worst plant conditions among the others; even though it has more

healthy plants than Plot 13, the condition of the plants that are languishing and dead in Plot 12 is more, so that plot 12 is the plot with the worst plant conditions. While the plot with the best plant conditions was plot 19 because there was only 1 plant in this plot that died, and 3 were languishing, this showed that the percentage of healthy plants in plot 19 was better than in the other plots. However, seen as a whole, this block of plants can be categorized as successful because it has good quality plants, namely healthy plant conditions of 96.44% and a fairly good percentage of healthy plant conditions, which exceeds 70%.

3.4. Plant Height

The average plant height in each plot was calculated by adding the height of each plant and then dividing it by the number of plants in the plot. Furthermore, the average plant height for each plot was recapitulated in graphical form. The graph of the results of the recapitulation of the average plant height in each measuring plot can be seen in Figure 4.

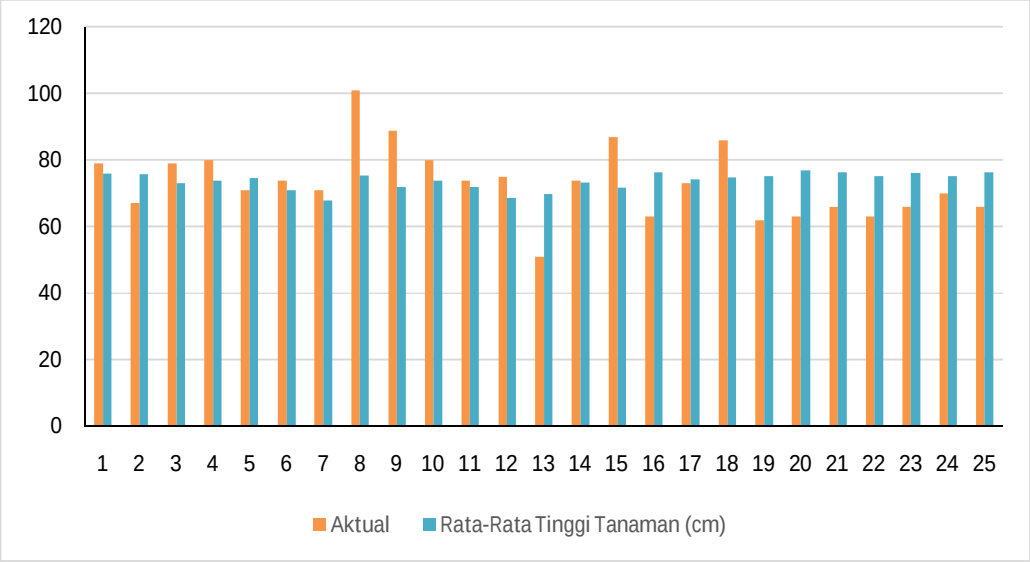

Figure 4. Percentage of Plant Height (Source: Result of Data Processing, 2022)

In the graph of plant height presented in Figure 3, it can be seen that the average plant height is 73.84cm. The plot with the highest plant height was plot 20, with an average plant height of 76.98 cm.The plot with the lowest plant height was plot 7, with an average plant height of 68.01 cm.

The plant height in this plantation is fairly good, which of course, is expected to continue to grow, especially if it is maintained intensively.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

Based on this research, it can be concluded that:

1.The plant growth rate in the rehabilitation activities has reached a very good growth percentage, namely 96.44%, or exceeding the requirement, namely 70%, sothis does not need to be replanted in the first year.
2. The quality of the 1 (one) year old plants in block 29 is very good, with 96% Healthy Plants with good crowns, sturdy stems, and fresh growing plants with an average height of 73.84 cm.

4.2. Recommendations

Based on the research, several suggestions related to the research that has been carried out are:

1. We recommend that the plant spacing is adjusted to the applicable provisions and consistently, namely 4x4m so that the number of plants in each plot is the same, so when you want to compare between plots, it is easier to measure.
2. This research needs to be continued in the following years, namely the 2nd, 3rd year, and so on, to see the success of the plants so that if embroidery is necessary, it will be known earlier.

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