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Plant Success Rate in Program Forest and Land Rehabilitation in Unity Batutegi Forest Management

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Abstract. Forest and Land Rehabilitation is one of the right solutions to overcome the problem of critical land. Efforts to overcome critical land are difficult to obtain in a short time to return the situation to its original state, but efforts are being made by the government to overcome the existence of critical land and the expansion of critical land, including through land conservation and reforestation. This study aim to determine the success of plants in a forest and land rehabilitation program in the village of Datar Lebuay in the Air Naningan district of Tanggamus regency. The study was carried out in June 2021. Field data collection was carried out by making plots using the *Systematic Sampling with Random Start* method, namely the first plot was made randomly and the next plots were made systematically. Sampling Intensity (IS) is 5%. The results showed that the success rate of RHL activities with a percentage of life was 79.74% which was classified as successful. Factors that are thought to influence the low success rate of plants are the condition of the planted seeds that are already in a damaged state and the planting season is not right.

1. Introduction

Efforts to overcome critical land are difficult to obtain in a short time but to overcome the existence of critical land and the expansion of critical land, the government carries out land conservation and reforestation [1]. Forest and Land Rehabilitation is one of the right solutions to overcome the problem of critical land [2]. The RHL program is a mass moral movement and involves various levels of society to restore forest and land damage [3]. Through the manufacture of forest plants within the framework of the RHL program, the fulfillment of economic needs that aims not to exploit forest wood by being replaced by *multipurpose tree species* (MPTS) as an effort to improve the welfare of forest communities [4]. RHL activities aim to restore forest and land conditions so that they can function normally and sustainably as a life support system. Forest and land rehabilitation aim to restore, maintain, and improve forest and land functions so that their carrying capacity, productivity, and role in supporting life support systems are maintained [5].

Community perception and participation are key factors in supporting and ensuring the success of the RHL program [6]. Paper [7] stated that a high perception of the importance of soil and water conservation is positively correlated with the form of conservation farming performance that is applied. From the description above, it can be seen that the perception factor and the level of participation will determine the success of the RHL program. Therefore, it is necessary to research the success rate in the RHL program in Datar Lebuay Village, Air Naningan District, Tanggamus Regency. The purpose of this study was to determine the success rate of plants in the Forest and Land Rehabilitation program in Datar Lebuay Village, Air Naningan District, Tanggamus Regency.

2. Research Method

The method used in the research on the success rate of plants is as follows.

2.1. Research Time and Place

This research was conducted in June 2021. The location of the research was in the working area of Gapoktan Mandiri Lestari which is located in the Protected Forest area of KPH Batutegi, Datar Lebuay Village, Sub-District Air Naningan, Tanggamus Regency, Lampung Province. A map of the location of the research area can be seen in Figure 1.

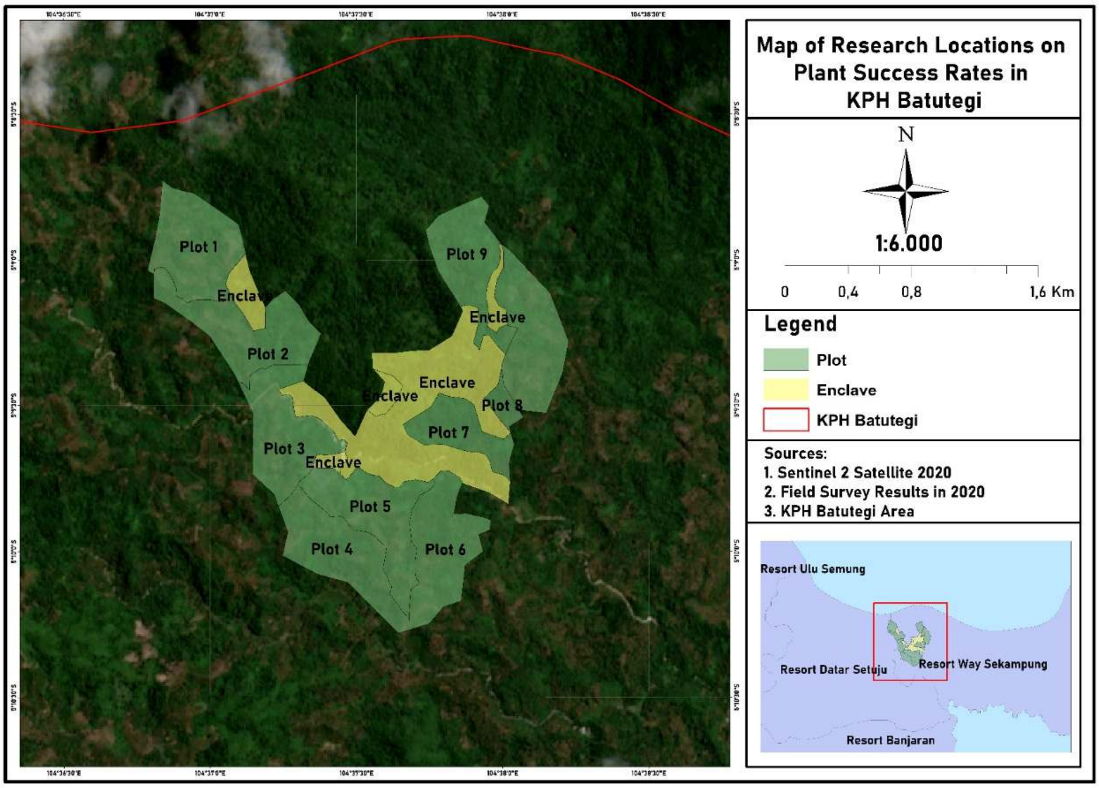


Figure 1. Map of research locations in the forest area of KPH Batutegi

2.2. Research Tools and Materials

The tools used in this study include stationery, camera, laptop, recording device/mobile phone, a small piece of zinc, compass, permanent marker, tape measure (50 m), tape meter (1.5 m), and *Global Positioning System (GPS).* The materials used in this study include tally sheets and measurement plant success. The object of this research is the forest area in KPH Batutegi and Gapoktan Mandiri Lestari who participated in the RHL program.

2.3. Method

2.3.1. Making Measurement Plots in the Field. The measuring plot is made through a sampling technique with the Systematic Sampling with Random Start method, namely The first plot is made randomly and the next plot is made systematically. Intensity Sampling (IS) of 5%. Placement of measuring plots of 0.1 Ha, rectangular (40m x 25m) or circular with a diameter of 17.8 m. The distance between the plots is 100 m north South and 200 m in the West-East direction, while to obtain the quality of the measurement results, the distance between the outermost measuring plot and the plant boundary, a minimum of 50 m and a maximum of 100 m is determined. Thus the sampling results obtained will be able to meet the principle of representativeness as in Figure 2 below.

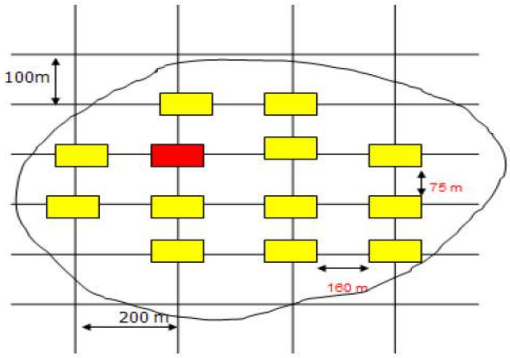
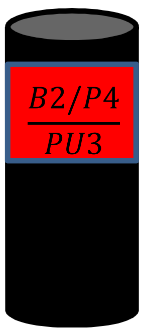


Figure 2. The layout of plant measurement plots on one block.

The number of plots can be calculated using the formula:

$$\mathbf{\Sigma PU} = \frac{\mathbf{IS \times N}}{\mathbf{n}} \quad \textbf{(1)}$$

Information:
ΣPU = Number of plots
IS = Sampling Intensity of 5%.
N = Plot area (Ha)
n = Area of the plot (Ha)
$\Sigma\text{PU} = \frac{(0{,}05 \times 230)}{0{,}1} = 115$ Measuring plot
The results of the PU assessment are marked by attaching zinc to the trees around the PU or stakes and written using a marker with the code as shown in Figure 3 below.



Information:

B2 : Block 2
P4 : Plot 4
PU3 : Measure Plot 3 on Block 2

Figure 3. Marks on trees in measuring plots.

2.3.2. Measurement of Plant Growth Percentage. Plant assessment includes the progress of work progress at each stage of work according to by Contract, measurement of plant area; number and type of plants; percent calculation grow plants. Stages of plant assessment activities: The measurement of the planted area is carried out on the realization of the planting area which is stated in the area planted in Ha units and compared to the planned plant area according to design.

After the plot has been made (total plants maximum in 1 plot is 40 plants). Next, count and observe the Staple Plants. The calculation results are then recapitulated in terms of area

Table 1. Recapitulation of the results of measuring plant area in each plot.

No	Block/Plot/Unit (Location plant)	Plant Area		
		Plan (Ha)	Realization	
			(Ha)	%
1				
2				

3

Information:

$$\text{Percent of Realized Plant Area (\%)} = \frac{\text{Measurement Result}}{\text{Plan}} \times 100\%$$

Based on KLHK RI Regulation No. P.2/MENLHK/SETJEN/KUM.1/1/2020 percent formula plant growth is calculated by comparing the number of plants in a measuring plot with the number of plants that should be in the respective measuring plot.

$$T = (\Sigma hi/\Sigma ni) \times 100\% \\ = (h1 + h2 + hn)/(n1 + n2 + nn) \times 100\% \quad (2)$$

Where:
T = Percent (%) of plant growth
hi = The number of plants that grow is in the measuring plot to i
ni = Number of plants that should be in the measuring plot to i

The average plant height is the average plant height obtained by averaging the height of each plant compared to the number of plants. The average height per plot is calculated as follows:

$$T = (\Sigma ti/\Sigma ni) \\ = (t1 + t2 + tn)/(n1 + n2 + nn) \quad (3)$$

Where
T = Average plant height in the plot
ti = Height of each plant in the ith measuring plot to i
ni = Number of plants in the ith measuring plot to i

Rehabilitation in Watersheds is carried out on Critical Land of at least 110 stems/ha Percentage of growth during third-year appraisal and submission of planting work P2 is at least 75% (seventy-five percent) of the total number of plants.

3. Results and Discussion

Plant assessment Forest and Land Rehabilitation calculates productivity indicators to be able to determine the value of the plants that have been planted in each plot. The level of productivity is something that needs to be considered in forest management, such as stated by [8] that high and low productivity in forests shows the level of success of forest management. The number of plots and the number of measuring plots that are made.

3.1. Plant Rating

3.1.1. Plot 1. Plot 1 (one) has an area of 30 Ha, with the number of measuring plots that can be made as many as 16 plots that we can see in the following table.

Table 2. Plant assessment of plot 1

Type Seeds	PLOT 1								Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	
Cloves	12	10	7	11	9	8	4	5	66
Petai	8	8	9	9	8	7	5	8	62
Jengkol	9	6	5	8	12	8	7	8	63
Durian	5	7	4	4	5	5	6	5	41
Jackfruit	5	5	6	6	3	5	5	6	41
Total per PU	**39**	**36**	**31**	**38**	**37**	**33**	**27**	**32**	**273**

Source: Field data for 2021.

Table 3. Advanced

Type Seeds	PLOT 1								Total
	PU 9	PU 10	PU 11	PU 12	PU 13	PU 14	PU 15	PU 16	
Cloves	7	8	8	7	6	5	5	6	**52**
Petai	3	6	8	4	7	4	8	6	**46**
Jengkol	7	8	9	9	9	7	6	6	**61**
Durian	6	4	2	6	4	8	7	4	**41**
Jackfruit	4	5	6	0	6	0	8	6	**35**
Total per PU	**27**	**31**	**33**	**26**	**32**	**24**	**34**	**28**	**235**

Source: Field data for 2021.

The plant height in block 8 is not uniform due to annual planting activities first or P0, many plants are damaged by wild animals so that embroidery is carried out. Although maintenance activities are carried out up to two years after planting, namely carrying out the activity of embroidering dead plants by replacing new plants, where the type of plant embroidery is not always the same as the type of plant that dies, but the seeds are planted as plants Embroidery is seeded from the results of the farmer groups' nurseries obtained from different types of seeds come from local habitats or seeds similar to local plants from other locations, as required in Permenhut No.26/Menhut-II/2010. However, due to conditions the seeds that are planted are not feasible and are seeds that are extracted so that the growth of the plant is abnormal or stunted. The number of plants counted up to now doesn't match with regulations based on the government with the number of plants in the measuring plot as much as 40 plants.

3.1.2. Plot 2. Plot 2 (two) has an area of 20 Ha, with the number of measuring plots that can be made as much as 11 plots with a variety of plant numbers and plant heights, we can see the number of plants in the following table.

Table 4. Plant valuation of plot 2

Type Seeds	PLOT 2											Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	
Cloves	8	8	7	8	9	7	9	9	9	6	7	**87**
Petai	7	7	4	7	9	9	6	8	6	8	5	**76**
Jengkol	9	7	5	5	7	6	8	6	7	0	8	**68**
Durian	2	6	2	4	7	7	5	7	5	7	6	**58**
Jackfruit	6	5	6	6	3	5	2	3	3	5	3	**47**
Total per PU	**32**	**33**	**24**	**30**	**35**	**34**	**30**	**33**	**30**	**26**	**29**	**336**

Source: Field data for 2021.

The number of plants in each measuring plot is influenced by the timing factor of the implementation of each stage the activities are not concurrent, so it is suspected that the condition/state of the planted seeds has changed in a damaged state due to the location conditions that are difficult to reach. On the plot of 2 types, the least number of plants is jackfruit with 47 plants, and the most types of plants are cloves with a total of 87 plants. Each measurement plot has the number of plants diverse.

3.1.3. Plot 3. Plot 3 (three) has an area of 30 Ha, with the number of measuring plots that can be made as many as 13 plots with a variety of plants and plant heights, the number of plants can be seen in the following table.

Table 5. Plant assessment in plot 3

Type Seeds	PLOT 3													Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	PU 12	PU 13	
Cloves	8	9	9	9	9	9	9	11	9	9	9	5	9	**114**

Petai	7	7	5	4	9	8	6	6	6	6	8	7	7	**86**
Jengkol	6	5	7	7	6	6	7	5	5	5	3	0	5	**67**
Durian	5	4	6	5	6	4	5	4	5	4	6	6	7	**67**
Jackfruit	4	6	4	5	7	5	5	6	4	6	7	8	4	**71**
Total per PU	**30**	**31**	**31**	**30**	**37**	**32**	**32**	**32**	**29**	**30**	**33**	**26**	**32**	**405**

Source: Field data for 2021.

3.1.4. Plot 4. Plot 4 (four) has an area of 27 Ha, with the number of measuring plots that can be made as much as 14 plots with a different number of plants and plant height, we can see the number of plants in the following table.

Table 6. Plant assessment in plot 4

Type Seeds	**PLOT 4**														**Total**
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	PU 12	PU 13	PU 14	
Cloves	8	8	8	8	8	7	8	9	8	5	5	6	7	9	**104**
Petai	5	6	6	5	5	5	5	5	9	5	6	7	5	7	**81**
Jengkol	8	7	7	6	8	9	8	8	9	6	7	6	8	6	**103**
Durian	5	5	5	5	6	5	5	5	5	5	7	6	8	5	**77**
Jackfruit	7	5	5	9	7	5	8	5	5	5	6	5	7	8	**87**
Total per PU	**33**	**31**	**31**	**33**	**34**	**31**	**34**	**32**	**36**	**26**	**31**	**30**	**35**	**35**	**452**

Source: Field data for 2021.

3.1.5. Plot 5. Plot 5 (five) has an area of 30 Ha, with the number of measuring plots that can be made as many as 16 plots with a variety of plant numbers and plant heights, we can see the number of plants in the following table.

Table 7. Plant assessment in plot 5

Type Seeds	**PLOT 5**								**Total**
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	
Cloves	7	7	5	7	5	7	9	7	**54**
Petai	7	4	4	6	6	6	6	7	**46**
Jengkol	6	4	7	4	6	5	5	5	**42**
Durian	5	6	6	5	5	5	6	5	**43**
Jackfruit	4	4	5	6	6	6	7	5	**43**
Total per PU	**29**	**25**	**27**	**28**	**28**	**29**	**33**	**29**	**228**

Source: Field data for 2021.

Table 8. Advanced

Type Seeds	**PLOT 5**								**Total**
	PU 9	PU 10	PU 11	PU 12	PU 13	PU 14	PU 15	PU 16	
Cloves	9	9	7	9	9	6	9	6	**64**
Petai	7	7	6	6	7	5	6	5	**49**
Jengkol	6	5	9	9	9	5	7	7	**57**
Durian	6	5	6	5	7	5	7	6	**47**
Jackfruit	6	7	7	5	5	7	7	5	**49**
Total per PU	**34**	**33**	**35**	**34**	**37**	**28**	**36**	**29**	**266**

Source: Field data for 2021.

3.1.6. Plot 6. Plot 6 (six) has an area of 30 Ha, with the number of measuring plots that can be made as much as 13 plots with a variety of plant numbers and plant heights, we can see the number of plants in the following table.

Table 9. Plant assessment in plot 6

Type Seeds	PLOT 6													Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	PU 12	PU 13	
Cloves	6	8	7	6	7	9	6	11	9	9	9	8	9	**104**
Petai	7	7	6	7	6	5	5	5	6	6	5	7	7	**79**
Jengkol	8	6	6	7	6	5	5	6	5	6	5	6	6	**77**
Durian	6	8	5	8	5	5	5	5	5	7	5	5	6	**75**
Jackfruit	6	8	5	6	5	4	6	6	5	6	5	5	5	**72**
Total per PU	**33**	**37**	**29**	**34**	**29**	**28**	**27**	**33**	**30**	**34**	**29**	**31**	**33**	**407**

Source: Field data for 2021.

3.1.7. Plot 7. Plot 7 (seven) has an area of 25 Ha, with the number of measuring plots that can be made as much as 11 plots with a various number of plants and plant height, we can see the number of plants in the following table.

Table 10. Plant assessment in plot 7

Type Seeds	PLOT 7											Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	
Cloves	9	7	5	9	5	9	5	5	5	6	5	**70**
Petai	7	8	7	6	7	6	5	7	5	7	8	**73**
Jengkol	7	5	7	7	8	9	7	9	5	5	5	**74**
Durian	5	4	7	7	5	5	4	4	5	8	5	**59**
Jackfruit	6	5	6	3	6	6	7	5	5	6	6	**61**
Total per PU	**34**	**29**	**32**	**32**	**31**	**35**	**28**	**30**	**25**	**32**	**29**	**337**

Source: Field data for 2021.

3.1.8. Plot 8. The 8 (eight) plots have an area of 10 Ha, with the number of measuring plots that can be made as much as 7 plots with various plant numbers and plant heights, we can see the number of plants in the following table.

Table 11. Plant assessment in plot 8

Type Seeds	PLOT 8							Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	
Cloves	6	11	9	9	6	7	9	**57**
Petai	9	5	7	7	8	8	8	**52**
Jengkol	8	9	7	8	9	8	8	**57**
Durian	3	8	0	0	6	0	5	**22**
Jackfruit	4	7	6	7	7	8	8	**47**
Total per PU	**30**	**40**	**29**	**31**	**36**	**31**	**38**	**238**

Source: Field data for 2021.

3.1.9. Plot 9 (forest replacement plot). Plot 9 (forest replacement plot) has an area of 28 Ha, with several measuring plots that can be used 14 plots were made with the number of plants and various plant heights, the number of plants we can see in the following table.

Table 12. Plant assessment in plot 9 (forest replacement plot)

Type Seeds	FOREST REPLACEMENT PLOT														Total
	PU 1	PU 2	PU 3	PU 4	PU 5	PU 6	PU 7	PU 8	PU 9	PU 10	PU 11	PU 12	PU 13	PU 14	
Cloves	9	8	9	9	8	9	9	9	9	8	9	9	8	9	**122**
Petai	8	7	9	9	9	8	8	9	8	9	9	9	4	8	**114**
Jengkol	7	7	8	9	9	4	4	7	4	7	7	9	6	5	**93**
Durian	5	7	4	4	6	6	7	4	5	7	5	5	4	4	**73**
Jackfruit	5	6	7	8	7	4	7	3	9	8	6	7	8	4	**89**
Total per PU	**34**	**35**	**37**	**39**	**39**	**31**	**35**	**32**	**35**	**39**	**36**	**39**	**30**	**30**	**491**

Source: Field data for 2021.

3.2. Plant Success

3.2.1. Number of Plants. Based on the data from the plant assessment in the second year of maintenance that has been carried out, the condition rehabilitation plants that have just been planted are generally relatively well-maintained so that the percent growth of the plant shows a fairly high success rate [9]. However, at each location of these activities, there are very striking variations or differences in terms of plant growth (height and diameter) [10]. This is due to the growth abnormal plant, even though it has not or not caused the death of the plant. Data that have been obtained have significant differences in each plot, ranging from the number of plants and height. We can see the data in the following table.

Table 13. Number of plants in Block 8

Type Seeds	Plot 1	Tall	Plot 2	Tall	Plot 3	Tall	Plot 4	Tall	Plot 5	Tall	Amount
Cloves	118	158	87	96	114	80	104	116	118	85	**423**
Petai	108	159	76	235	86	178	81	189	95	185	**338**
Jengkol	124	145	68	90	67	167	103	90	99	80	**337**
Durian	82	85	58	87	67	85	77	88	90	77	**292**
Nangka	76	160	47	92	71	81	87	98	92	117	**297**
Total	**508**		**336**		**405**		**452**		**494**		**1687**

Source: Field data for 2021.

Table 14. Advanced

Type Seeds	Plot 6	Tall	Plot 7	Tall	Plot 8	Tall	Plot 9	Tall	Amount
Cloves	104	156	70	155	57	110	122	98	**353**
Petai	79	78	73	98	55	65	114	65	**321**
Jengkol	77	125	74	76	57	70	93	78	**301**
Durian	75	80	59	75	22	106	73	56	**229**
Jackfruit	72	75	61	76	47	79	89	69	**269**
Total	**407**		**337**		**238**		**491**		**1473**

Source: Field data for 2021.

In general, the types of plants found living in the location of forest and land rehabilitation activities during the planting period are the same type as the plants grown in embroidery activities during the activity period. Based on a literature review of the annual plant appraisal report Second, maintenance for all periods of the planting year, this type is a type of embroidery carried out during maintenance activities [11]. Selection of plant types in Planting determines the high percentage of plant life because it involves basic principles implementation of rehabilitation so that it must refer to the principle of conservation of species diversity, fostering and improving habitat quality and suitability of growing places [12, 13].

3.2.2. Plant Growing Percentage. The success rate of plant growth that lives in RHL activities in KPH Batutegi can be estimated by calculating the proportion of plant life. Based on plant measurement data, the proportion of plant life of each plot is presented in Table 15.

Table 15. Percentage of plant growth in Block 8.

PLOT	LARGE	AMOUNT PU	TOTAL SEEDS	PERCENT GROW
Plot 1	30	16	508	79.38%
Plot 2	20	11	336	76.36%
Plot 3	30	13	405	77.88%
Plot 4	27	14	452	80.71%
Plot 5	30	16	494	77.19%
Plot 6	30	13	407	78.27%
Plot 7	25	11	337	76.59%
Plot 8	10	7	238	85.00%
Forest Substitute	28	14	491	87.68%
€	**230**	**115**	**3,668**	**79.74%**

Source: Field data for 2021.

The percentages of plant growth in Block 8 have different percentage values. Plot 1 with a plot area of 30 ha has a plant growth percentage value of 79.38%, plot 2 has a 20 Ha land area has a plant growth percentage value of 76.36%, plot 2 has a land area of 20 Ha has a plant growth percentage value of 76.36%, plot 3 has a land area of 30 Ha has a plant growth percentage value of 77.88%, plot 4 has a land area of 27 Ha and has the percentage value of plant growth is 80.71%, plot 5 has a land area of 30 ha which has a value of the percentage of plant growth is 77.19%, plot 6 has a land area of 30 ha which has a value of the percentage of plant growth is 78.27%, plot 7 has a land area of 25 ha which has a value of the percentage of plant growth is 76.59%, plot 8 has a land area of 10 ha which has a value of percentage of plant growth is 85%, plot 9 (forest replacement plot) has a land area of 28 Ha has a plant growth percentage value of 87.68%. So that the percentage value of growth is obtained total plant block with an area of 230 Ha with a total plot of 115 and the number of plants as much as 3,668 plants have a value of 79.74%.

4. Conclusions and Suggestions

4.1. Conclusion

The conclusion obtained in this study is the activities of planting forest and land rehabilitation carried out for 3 years had a total of 3,668 plants, with a percentage value of different plots and different plant heights according to when the crops were planted. The taller the plant, the older the plant is generally. In general level the success of forest and land rehabilitation activities with a percentage of the life of 79.74% which classified as successful. Factors thought to influence the low level of plant success are the state of the seeds planted are in a damaged state, planting inappropriate planting season, less than optimal maintenance and implementation of activities carried out is not carried out as a unified whole, but as a separate activity. separate from the nursery, planting, and maintenance.

4.2. Suggestion

Hkm KPH Batutegi farmers need to receive training facilities to prepare plant care independently and obtain convenience in developing their farming business. Besides it is necessary to conduct counseling by government agencies aimed at farmer groups to accommodate the aspirations of farmers so that farmers have the power to determine better actions profitably so that farmers have sufficient knowledge to choose to start activities independent planting.

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