

VEGETATION ANALYSIS OF SEEDLING AT FORMER BURNING MIX FOREST AT MOUNT BAWAKARAENG

Muhammad Wiharto^{1*}, Herlinda Haruna², Fatma Hiola¹, Muhammad Wijaya³, and Hamka L¹.

¹Lectures at Dept. of Biology, UNM

²Student of class 2010 at Dept. of Biology, UNM.,

³Lecture at Dept. of Chemistry, UNM.

* wiharto09@gmail.com

ABSTRACT

*Bawakaraeng Mountain is one of the seven mountains in South Sulawesi. Forest damaging on Mount Bawakaraeng occur naturally or by human activity. Forest regeneration can not be separated from the role of seedlings. The purpose of this study is to determine the structure and composition of the vegetation tree seedling at Former Burning Mix Forest at Mount Bawakaraeng. Vegetation data was obtained on a flat, gentle slope and rather steep slope area. Sampling was conducted on a 100 m transect and repeated 5 times. On each transect 10 quadrats with the size of 5 x 5 m were placed with 5 m distance of each. Density of each species was taken. The data taken is the amount of presence of individuals of each species (density / density). Biotic environmental data covering canopy closure. Abiotic factors include: the geographical coordinates and altitude, pH and temperature of soil, slope and substrate. Important Value Index is calculated for each species. The species found are *Acacia mearnsii* De Wild., *Buchanania sessilifolia* in all areas, *Eucalyptus urophylla* S.T. Blake. in a gentle slope and rather steep slope, while *Pinus mercusii* only on flat slope. Highest number of individual seedlings was on steep slope, which were 137 and the least was on the flat slope, which were 49. The most dominant species in terms of density, frequency and importance value index at the entire slope was *A. mearnsii*.*

Keyword: *Seedling, Former Burning Mix Forest, Mount Bawakaraeng*

INTRODUCTION

Bawakaraeng Mount is one of the seven (7) highest peak that lies in South Sulawesi region at an altitude of 2,883 m asl, located at 119 ° 56'40 "E and 05 ° 19'01" latitude and has a temperature range of about 17 ° C up to 25 ° C. Bawakaraeng mount vegetation is dominated by lowland forest, lower montane forests and montane forests (Karsa, 2013). The headwaters of the Jeneberang is located at the western slope of Mount Bawakaraeng, where at the downstream located Bili-Bili Dam which is the catchment area for Gowa and Makasar (Sumaryono & Yunara, 2011).

Mountain environments are susceptible to degradation. This region is very strongly influenced by the damage processes. Shifting tectonic plates will cause earthquakes and volcanic eruptions. While heavy rain on the steep slopes can

cause landslide and mud flows and lava (FAO, 2011).

Damage to the forest on Mount Bawakaraeng occurs naturally or is caused by human activity. The area has been destroyed by fire in October 2013 as recorded in Wartatimur.com (2013), there has been a fire in a climbing lane heading one of backwoods Lembanna, District Tinggimoncong, Gowa, South Sulawesi Province, to the summit of Mount Bawakaraeng. This incident occurred on Wednesday (16/10) that result in reduced vegetation in the region. As for the damage caused by human activities including the deliberate fires and the felling of trees and the opening track by hikers.

Saplings is the beginning of a process of regeneration of an ecosystem in which it is strongly influenced by the level of disruption to the ecosystem. Ecological knowledge of seedlings is very vital. Not

only for the understanding of the process of going to a new and succession but also to the development strategy for the conservation of biodiversity and restoration of tropical forests (Septiansa, 2012). Is an important component of forest trees. All kinds of trees start growing from seed (Kapludin, 2010). Forest regeneration can not be separated from the role of tree saplings (Marpaung, 2009).

Based on the information outlined above, there should be analysis of the vegetation especially vegetation tree saplings in the forest area Mountain Nature Bawakaraeng. The purpose of this study is to determine the structure and composition of the vegetation on the tree saplings mixed forest area burned Mount Bawakaraeng.

RESEARCH METHODS

The study was conducted in a former burning mix forest at Mount Bawakaraeng Gowa, Province of South Sulawesi, and was conducted in March to June 2014. The seedlings of trees are the tree plants that have trunk diameter at a height of 1.3 m smaller than 5 cm. Vegetation data were obtained on three slope areas which refers to the Ministerial Decree No. 83/kpts/Um/11 190, namely: category 1 with gradients of flat to gentle slope that is 0-15%, category 2 with a rather steep slope that is 15-25%, and the category 3 with a steep slope that is 25-45%.

Sampling was conducted on a 100 m transect and repeated 5 times at each slope category. There were 15 transects for all slope categories. On each transect we placed 10 quadrats with size of 5 x 5 m and

a distance of 5 m, so the total quadrats in this study are 150 squares.

Vegetation data encompasses of: frequency of seedling presence and the number of individuals of each species. The canopy covering above the quadrats were estimate. We also recorded; (1) The geographic coordinates and elevation of the observation plot. (2) pH and soil temperatures. (3) The slope and. (4) The type of soil substrate. Important value index (IVI) of each seedling species were calculated using the following formula: $IVI = \text{relative density} + \text{relative frequency}$ Kusmana (1997).

RESULT

1. Species composition of seedling trees

There were four seedling species compositions with different families found at the study site. This indicates that there is no dominant families in terms of number of species seedlings. *Acacia mearnsii* De Wild., and *Buchanania sessilifolia* were found in all areas of the slope, *Eucalyptus urophylla* S.T. Blake., seedlings was found on a gentle and steep slope, while *Pinus* was only found on a flat slope.

2. Vegetation structure of seedling trees.

a. Flat Slope

The flat slope has a slope of 0-3%. In this area three seedling were found. *A. mearnsii* species is the dominant seedlings compared with the two other species. *A. mearnsii* made up 89% of the total density of species that exist and were present in 15 observation plots also has the highest IVI (172.2). The lowest IVI was owned by *P.merkusii* with a value of 10 (Table 1).

Table 1. Seedling’s vegetation analysis at flat slope

No.	Spesies	D	F	DM		DR	FR	IVI
				1250 m ²	0.125 ha			
1.	<i>Acacia mearnsii</i> De Wild	40	15	0.032	320	89	83.3	172.2
2.	<i>Buchanania sessilifolia</i>	3	2	0.0024	24	7.0	11.1	17.8
3.	<i>Pinus merkusii</i>	2	1	0.0016	16	4.0	5.6	10
Total		45	18	0.360	360	100	100	200

D: Density; F: Frequency; DM: absolute density; DR: relative density; FR: relative frequency; IVI: Important Value Index

There are two species that are in the low density grade interval (1-15) which are *B. sessilifolia* and *P.merkusii*. Both species only make up 11% of the total density of existing species. There is one species in the highest grade interval (31-45) which is *A. mearnsii* (Figure 1). This indicates that there is only one dominant species on flat areas.

On the flat slope no species that are in the highest frequency interval class. There are two seedlings in the lowest interval class (1-10) which are *B.*

sessilifolia and *P. merkusii* and one species in the second lowest interval class, which is *A. mearnsii*. This indicates that species at a flat slope has a narrow distribution (Figure 2).

Abiotic environment on flat areas have a soil substrate, located at 1696 m - 1742 m asl. Soil temperature range between 19 °C - 25 °C, with average 2.5 % of crown cover and average 5.7 of soil moisture. This area has an average 1 cm of litter depth that dominated by ferns. The soil pH has an average of 6.5.

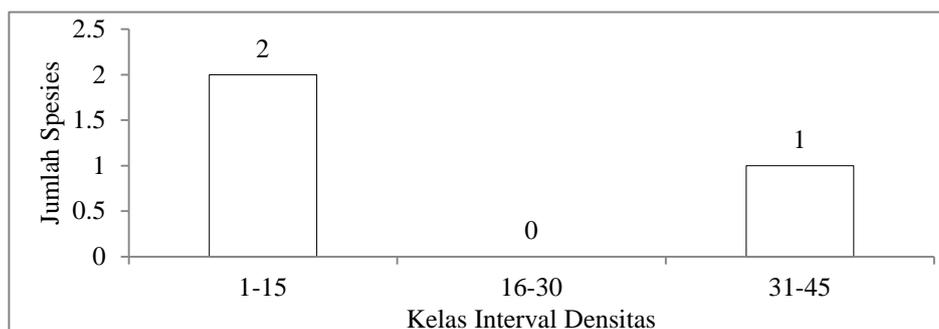


Figure 1. Seedling’s Density distribution at flat slope

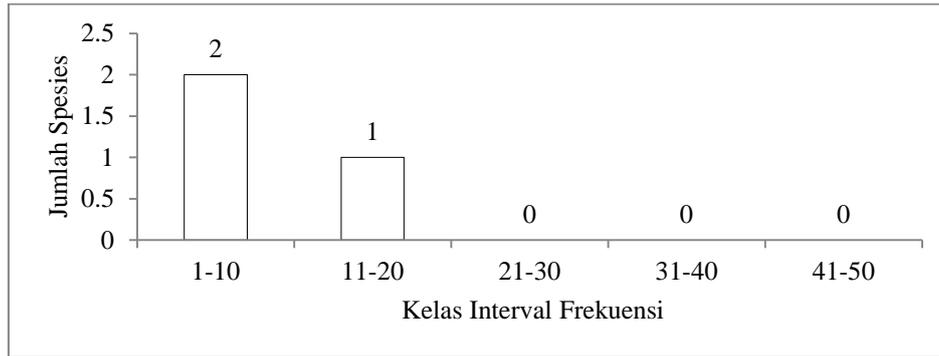


Figure 2. Seedling's Frequency Distribution at flat slope

b. Gentle Slope

The gentle slope area has a slope of 10 %. The IVI of species *A. mearnsii* (163.4) is the highest compared to other species and *E. urophylla* has the lowest IVI (17.2). *B. sessilifolia* species were also found on a flat area with IVI of 19.4. *E. urophylla* and *B. sessilifolia* only make up 12.8% of the total density of species. Both species are found on five plots of observation (Table 2).

Two species occupying the lowest density grade interval which are *B. sessilifolia* and *E. urophylla*. This indicates that these two species have a fairly low number of individuals of all species in the gentle slope. Species occupying the highest density class interval is *A. mearnsii* that is class 61 to 90 (Figure 3). It also suggests that *A. mearnsii* is the most dominant species on the sloping area.

Table 2. Seedling's vegetation analysis at gentle slope

No.	Spesies	D	F	DM		DR	FR	IVI
				1250 m ²	0.1250 ha			
1.	<i>Acacia mearnsii</i> De Wild	82	32	0.0656	656	87.2	76.2	163.4
2.	<i>Buchanania sessilifolia</i>	7	5	0.0056	56	7.5	11.9	19.4
3.	<i>Eucalyptus urophylla</i>	5	5	0.004	40	5.3	11.9	17.2
Total		94	42	0.0752	752	100	100	200

D: Density; F: Frequency; DM: absolute density; DR: relative density; FR: relative frequency; IVI: Important Value Index

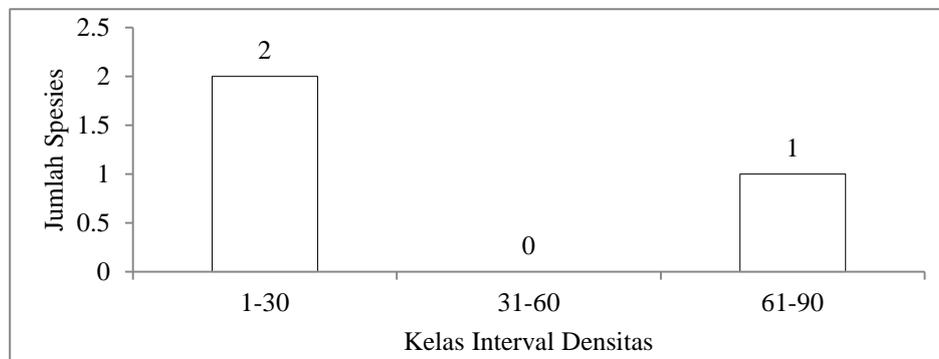


Figure 3. Seedling's Density distribution at gentle slope

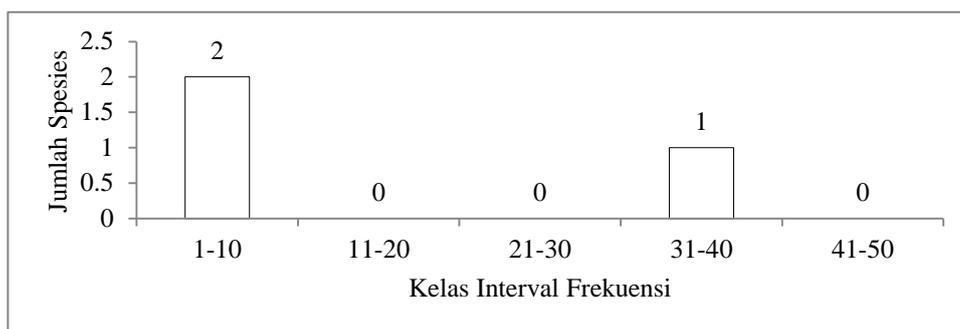


Figure 4. Seedling's Frequency Distribution at gentle slope

Two species that are at the lowest frequency interval class (1-10) found that *E. urophylla* and *B. sessilifolia*. This indicates that these two species have uneven distribution, while the species *A. mearnsii* found in 38 plots of observation occupies the second highest frequency interval class (31-40), which indicates that this species has distributed fairly evenly (Figure 4).

The gentle slope area has a slope of about 10%, with substrate consisting of soil, large and small rocks, as well as charcoal from burnt trees. Elevation ranges between 1655 m - 1757 m asl. The average of litter is 0.7 cm with range soil pH between 6.0 to 7.0. An

average of canopy cover is 1.4%, soil moisture ranges from 2.4 - 7.6. This area has the average soil temperature of 24.4⁰C.

c. Steep Slope

The steep slope area has a slope of 19-24%. There are three seedlings in this area. Species that have the highest IVI is *A. mearnsii*, (150.64) and is found in 37 plots of observation. These species make up 76.6% of the total density of species. The species with the lowest IVI is *E. urophylla* with a value of 11.65. These seedlings are only found in four plots of observation (Table 3).

Table 3. Seedling vegetation analysis at steep slope

No.	Nama Spesies	D	F	DM		DR	FR	IVI
				1.250 m ²	0.125 ha			
1.	<i>Acacia mearnsii</i> De Wild	105	37	0.084	840	76.6	74	150.6
2.	<i>Buchanania sessilifolia</i>	27	9	0.0216	216	19.7	18	37.7
3.	<i>Eucalyptus urophylla</i>	5	4	0.004	40	3.6	8	11.7
Total		137	50	0.1096	1096	100	100	200

D: Density; F: Frequency; DM: absolute density; DR: relative density; FR: relative frequency; IVI: Important Value Index

There are two species occupying the lowest density of the class interval. Only one species that are at the highest density interval class (81-120) which is *A.*

mearnsii. This indicates that the species is dominant on a steep slope (Figure 5). Species *B. sessilifolia*. and *E. urophylla* occupy the lowest frequency class interval

(1-10), which indicates the low presence of such species. One species occupying the second highest frequency interval class

(31- 40) namely *A. mearnsii* indicating that the species has spread fairly evenly (Figure 6).

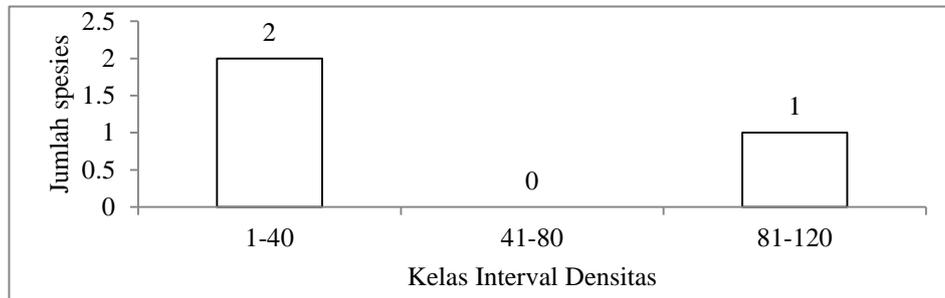


Figure 5. Seedling's Density distribution at steep slope

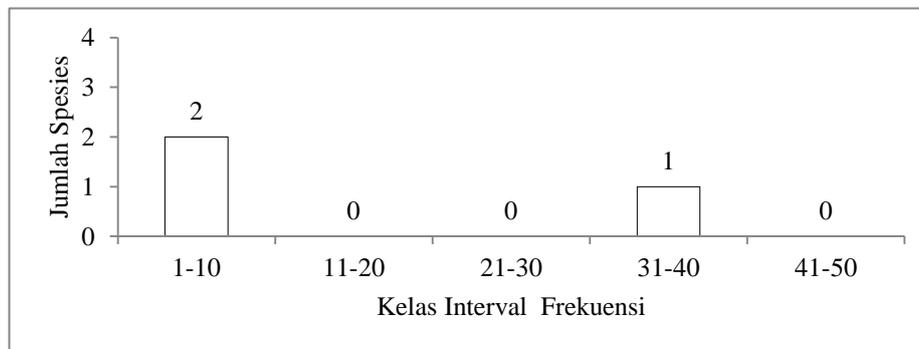


Figure 6. Seedling's Frequency Distribution at steep slope

DISCUSSION

Species *A. mearnsii* is an invasive species. This plant is able to grow rapidly and produce seeds in large quantities so it can survive in the long term. It is used widely in Australian for land restoration activities at burnt area (Samagni, 2015).

P. merkusii is found in very small quantities in a flat area suggesting that the species are not able to grow well at higher elevations. Observations in the field at the research location area showed that forests with *P. merkusii* as the dominant species is only found at an altitude of about 1500 m above sea level. On top of that altitude there exist natural forest and mixed forest. Fajrin (2014) research's at the same location but at the different time when the area has not burned yet showed that seedling of *P. merkusii* only found as many as two individuals. Flat slope conditions are suspected of causing a fire can spread

quickly in this region than in the gentle and steep slope. It causes the flat slope is more difficult to recover so that the seedlings were found at least.

REFERENCE

Fajrin, I. 2014. *Analisis Vegetasi Anakan Pohon Pada Kawasan Hutan Campuran Di Gunung Bawakaraeng Sulawesi Selatan*. Skripsi. Jurusan Biologi, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Makassar, Makassar.

FAO. (Food and Agriculture Organization of The United Nation). 2011. *Why invest in sustainable mountain development?* Viale delle Terme di Caracalla – 00153, Rome Italy.



- Marpaung, B.A. 2009. Struktur Vegetasi. [http: // www.xa.yimg.com/kq/groups/17149844/2112086958/name/STRUKTUR +VEGETASI.pdf](http://www.xa.yimg.com/kq/groups/17149844/2112086958/name/STRUKTUR+%VEGETASI.pdf). Diakses pada tanggal 22 Oktober 2014
- Kapludin, Y. 2010. *Suksesi dan Regenerasi Hutan* . <http://www.bio.unidar.ac.id/2010/03/18/suksesi-hutan/.html>. Diakses pada tanggal 17 Januari 2014. [Skripsi].
- Karsa, 2013. *Bawakaraeng Puncak Gunung Tertinggi di Sulawesi Selatan*. <http://www.hasbihtc.com/bawakaraeng-puncak-gunung-tertinggi-di-sulawesi-selatan.html>. Diakses pada tanggal 19 Oktober 2013
- Keputusan Menteri Nomor 83/kpts/Um/11 190 Tentang Kriteria Dan Tata Cara Penetapan Hutan Lindung
- Kusmana, C. 1997. *Metode Survey Vegetasi*. PT. Penerbit Institut Pertanian Bogor, Bogor.
- Samagni. 2015. *Acacia mearnsii De Wild. Overview*. [online] India Biodiversity Portal, Available at: <http://indiabiodiversity.org/biodiv/species/show/228561> diakses tanggal 26 Desember 2015.
- Septiansa, A. 2012. *Struktur dan Komposisi Anakan Pohon di Bekas Plot Permanen Bukit Gajabuih*. FMIPA-Universitas Andalas, Padang.
- Sumaryono & Yunara, D.T. 2011. *Komposisi dan Struktur Vegetasi pada Areal Hutan Bekas Terbakar (di Areal UPT Taman Hutan Raya R. Soerjo, Malang)*. Departemen Silviculture Fakultas Kehutanan Institut Pertanian Bogor., Bogor.
- Wartatimur.com. 2013. Pos 1 Jalur Pendakian Gunung Bawakaraeng Terbakar. (Online) <http://wartatimur.com/pos-1-jalur-pendakian-gunung-bawakaraeng-terbakar.html> diakses tanggal 26 Desember 2015