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POPULATION STUDY OF GANDARIA *(Bouea Macropylla* Grifith) IN RUMAHTIGA VILLAGE, AMBON

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ABSTRACT

This research was conducted to determine the gandaria population and the factors that influence it. The method used was the 10 m X 10 m plot method, with a total of 240 plot plots at 7 different stations based on the presence of gandaria plants. There were 976 trees with a density value of 0.09 ind/m2 or ± 1 individual/11 m2, with a cluster distribution pattern. Factors that affect the gandaria population are the burning of the gandaria population area, land conversion by humans, changes in plant types and factors of increased population growth.

Keywords: *bouea macrophylla, population, density*

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INTRODUCTION

Gandaria (Bouea macrophylla Griff.) is a tropical fruit plant whose distribution is very rare in Indonesia. The distribution of gandaria plants in the Maluku region is not evenly distributed across all islands, only found in several regions, namely Ambon Island as the largest production center and Central Maluku Regency, especially the islands of Saparua and West Seram (Tanasale, 2011). Ambon Island is geographically located at 3–4^0 South Latitude and 128 –129^0 East Longitude, with a total area of 337 km^2 which is composed of two peninsulas, namely the Leihitu Peninsula and the Leitimur Peninsula. This island is overgrown with local gandaria species whose presence is abundant and forms a forest which is used as a protected forest. Gandaria is one of the dominant trees in the catchment area forest, very useful for storing water and protecting the area around the catchment from flooding and erosion (Papilaya, 2002). In addition, gandaria can be used as a conservation plant because of its dense, compact canopy and well-developed and strong root system to prevent erosion (Tangkuman, 2006). The gandaria tree can be used as a shade tree because of its shady crown (Rifai, 1992).

On the island of Ambon, gandaria usually grows around the house and in the garden along with other plants such as mangosteen, durian, salak, langsat, kecapi, and other nuisance plants with a high density and frequency of presence and the ability to spread from the coastline to the mountainous areas. If this situation is left unchecked, the growth and development of gandaria plants will be increasingly pressured (Papilaya, 2007). These tree plants are more common in the plains along the watershed to the slopes around the river. Research activities on the gandaria tree population on Ambon island have been carried out, especially in several villages that have large populations of gandaria trees, namely the villages of Soya, Kusu-Kusu Sere, Naku (Tanasale, 2011), Hunuth (Taihitu, 2013a) and Hative Besar (Taihutu, 2013b). In the city of Ambon, gandaria can be found in the village

of Rumahtiga, but along with population growth and the need for land for other uses, the population is decreasing. Based on the description above, it is necessary to conduct research on the total population of gandaria plants and the factors that influence the growth of the population of gandaria plants in Rumahtiga village.

METHODS

The type of research is observation. The author visited the research location to collect data. The research location in Rumahtiga Village, Teluk Ambon District.

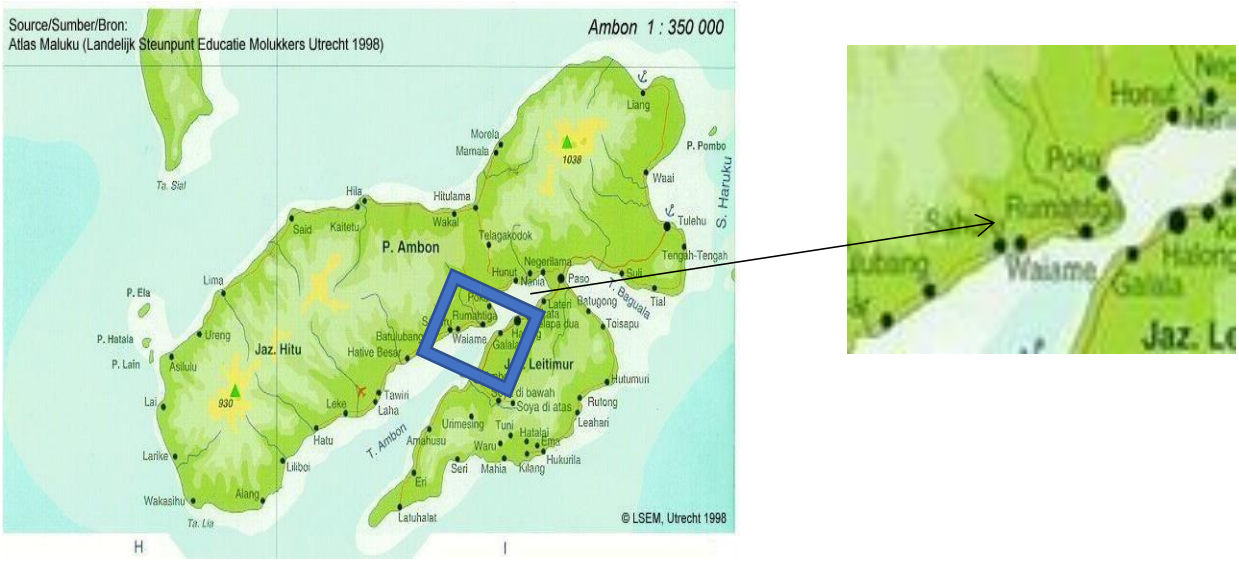

Figure 1. Location Map of Rumahtiga Village (Google Earth)

Material

The equipment used in this study was a tape measure, raffia rope, scissors, bamboo or wooden pegs, camera, stationery.

The selection of observation stations was carried out in areas that have gandaria plants. Areas were determined randomly into 7 observation stations based on the presence of gandaria plant populations.

1. Station 1 : area of Church and Arumbae (residential area)
2. Station 2: side area of LPMP (community farming/community forest area)
3. Station 3: area behind the LPMP (near residential area)
4. Station 4: area kota jawa (near residential area)
5. Station 5: Kotamahu area (community farming area/community forest)
6. Station 6 : Taeno area (residential area)
7. Station 7: Taeno Baadila area (community farming area/community forest)

Data collection was carried out using the plot/plot method, with a total of 240 sample plots made with the size of each plot or plot of 10 m x 10 m, after which each plot identified how many gandaria plants were contained in the plot including the diameter of the tree . The identification data was analyzed using a formula to determine density. Apart from counting the number of gandaria trees from each plot, the number of seedlings, saplings and poles in the plot was also count.

Data analysis

Analysis of the density and distribution patterns of gandaria plants, using the following formula:

1. Density

Density is calculated using the formula (Krebs, 1994) as follows

$$\text{density Sp (ind/m2)} = \frac{\text{number of individuals of an sp}}{\text{the total area of the observation plot}}$$

1. Spread pattern

$$I = \frac{S(\varepsilon n^2)}{}$$

N(N-1)

I = index morisita

N = total number of sp kei-I individuals in the observation plot

N = total number of individuals

S = total number of observation

In the distribution pattern is determined by using indicators; If I < 1 then the distribution pattern is uniform, if 1>1 then the distribution pattern is group, if I = 1 then the distribution pattern is random.

DISCUSSION RESULT

Location Characteristics

1. Temperature, Altitude, Rainfall and Humidity

Rumahtiga village based on the Smith-Ferguson climate classification is known to be type B (wet) with temperatures from 25.9-26.4 or an average of 26.1 oC. The altitude of the location is from 47-64 m asl with an average height of 55 m asl. Rainfall in Rumahtiga village is between 94.8-98.4% with an average of 96.6 % (Picauly 2007) (Table 1).

Table 1. Characteristics of Rumahtiga Village Land

Land Characteristics	Observation result
Temperature	25.9-26.4°C
Height	47-64 m dpl
Rainfall	3028.4 mm
Humidity	94.8-98.4 %
Drainase	Well, bad
Land	Gleisol, aluvial, kambisol
Texture	coarse, smooth, medium
Soil reaction	pH7 (netral)

(Sumber: Picauly, 2007)

1. Soil

In the Rumahtiga area there are 3 types of soil namely Gleisol on the mainland, Alluvial and Cambisol types on the slopes and hills a. Gleisols on the mainland. Has the following characteristics: dark grayish brown to dark gray in color, poor/obstructed drainage; sandy loam texture; sandy loam and sandy loam; crumb and cube structures; wet and loose consistency; organic matter a lot, medium and a little; pH 7. b. Alluvial and cambysol on slopes and hills. Alluvial textured sandy loam and sandy loam; crumb and cube structures; overtime consistency; yellowish red to dark yellowish brown; little, medium and a lot of organic matter; pH 6-7.

The dominant cambysol is found because this soil type is generally found in hilly and sloping areas. Cambisol soil is olive brown to light yellowish brown; texture of clay, sandy clay, clayey loam, dusty loam, dusty clay loam, loam, sandy loam, sandy loam; crumb and cube structures; loose and firm consistency; organic matter a lot and a little; good drainage; pH 5-7 (Picauly, 2007).

2. Soil drainage, soil texture and soil reaction. Drainage describes the water system in one land. In the field, drainage is grouped based on the color of the soil profile. From the results of observations of the soil profile in Rumahtiga, it turns out that the drainage conditions in Rumahtiga are generally good, but there are several places that have rather poor drainage conditions (Picauly, 2007). The texture of the soil in Rumahtiga village ranges from slightly coarse to finer to finer. Soil reactions indicate the chemical status of the soil. Soil chemical status influences biological processes such as plant growth. The soil in Rumahtiga is neutral soil (pH = 7) (Picauly, 2007).

Table 2. Growth Rate of Gandaria Plants in Rumahtiga

Located	Wide	Seedling	Weaning	Pole	Tree
Church and Arumbae	250m ^{2}	-	-	-	12
Behind LPMP	1000m^2	1585	15	9	107
LPMP	1000m^2	2348	11	12	141
Kota Jawa	3000m^2	6909	35	21	255
Kota Mahu	1000m^2	3074	11	7	32
Taeno	250m^2	15	2	1	28
Taeno Baadila	4000m^2	70.756	51	45	401
Total		**84.687**	**125**	**95**	**976**

Research conducted in residential areas, the gandaria tree population per plot only ranges from 3-5 trees per plot. In areas far from settlements, the number of gandaria trees can range from 5-9 trees per plot. Even in areas behind LPMP the number can reach 11 trees per plot. This also applies to tree diameter, where tree diameters range from 26 cm-2.95 m. Based on the results of the area plots with the most gandaria tree populations are areas far from residential areas or people's agricultural areas. Conversely, areas that have a small population of gandaria trees are residential areas, so the farther from the settlements, the higher the density of gandaria. Based on the data in Table 7, it shows that the area with a high gandaria population in Rumahtiga village is the Baadila area, with 240 plots made, 108 plots in that area. While the areas with the least population are the church road area and Arumbae, namely 4 plots. The church and Arumbae road areas are in the middle of a residential area or in the center of the village. In this area apart from clearing land for residential areas, construction of government buildings and schools which resulted in a decrease in the gandaria population, this was also due to the burning of the gandaria population due to social conflict several years ago. Habitat changes have caused the gandaria population, which previously existed in many residential areas as a shade plant, to decrease due to burning, logging and deliberate killing to make way for agricultural land. This is evidenced by the traces of trees that were burned or felled. This is in line with the theory put forward by Campbell (2004) that species populations have been reduced to very low numbers due to habitat change by humans.

The reduced population in residential areas was caused by the addition of new residents after the social conflict, as a result, many of the gandaria trees left in post-conflict settlements were cut down as land for building houses. According to Campbell (2004) habitat destruction by human activities often involves reducing the area of suitable habitat for populations and fragmentation of the remaining areas. Human activities have caused the gandaria population that used to be in residential areas to lose suitable habitat so that the population in settlements has decreased to a very low number. The population has lost its habitat because now more land has changed its function. In the area behind the LPMP and beside the LPMP which is the boundary area between settlements and people's agricultural areas, the gandaria population can still be maintained even though this area is not too far from settlements. Since ancient times this area has been specifically used for gandaria plantations so that even though it is an area affected by social conflict, it has not destroyed the existing gandaria population. This area is a limiting area, so the population development of this area is also limited by the size of the area. Areas that are outside of this area are residential areas, so the development of the gandaria population that occurs in this area is smaller. For the upper part of the City of Java, which is also close to residential areas, the size of the population area that used to be large is now starting to decrease. According to local residents, the gandaria population in this area has decreased compared to a few years ago. This is due to its position behind the public cemetery (Maqbar City of Java), so that the expansion of the burial area into the gandaria population area continues to occur in line with human deaths. As a result of this expansion, there will be continued logging of gandaria trees and a narrowing of the population area. In addition to the factor of expanding the location of public cemeteries, the Upper Java City area also saw the demolition of mountain bodies for a sand mining project which resulted in the cutting down of many gandaria trees. If these two things are allowed to continue, there will be a significant decline in the gandaria population in the area.

In the Kotamahu area, which is dominated by community forests, the gandaria population has not experienced much disturbance because it is far from residential areas and there are more people's agricultural lands which are family-owned lands. However, there are also parts of the area that were originally gandaria crop areas, which have now been converted into vegetable and bean farms. The Taeno area, which is a residential area, has a small number of gandaria trees because the gandaria trees function more as shade plants for the community, as a result, many gandaria saplings, especially the seedlings, are often removed due to the function above. The opposite happened in the Taeno Baadila area which is not a residential area. The large area for development makes the number of gandaria trees in this area more than in other plot areas and it is likely that the number will continue to increase.

Spread Pattern

Based on the results of calculating the gandaria population using plots, then calculations are carried out using the morisita index to determine the distribution pattern of gandaria in Rumahtiga village which can be seen in the table below.

Table 3. Pattern of Distribution of Gandaria Plants in Rumahtiga Village

Species	Index Morisita	Spread Pattern
Gandaria	7. 006	Group

The distribution pattern of the gandaria population in Rumahtiga village was found in all plots. This is presumably due to the favorable habitat, in terms of soil and weather conditions, which are suitable for grouping individuals. Ewusie (1980) states that in nature there are various levels of grouping as a result of grouping individuals depending on the specific characteristics of the place where they live (habitat), weather and other factors, the type of dispersal pattern that characterizes the species and the level of preference for groups.

The group lifestyle in gandaria causes survival to increase when conditions are unfavorable. Climate or extreme weather can be minimized by maintaining a microclimate within their group. This is in line with the opinion of Ewusie (1980) that grouping can result in increased competition between individuals for food or space. But this is more than offset by the increased survival of the group during unfavorable times because the surface area of the longest in its environment is less, compared to its time period and when the group is also able to modify its microclimate favorably.

There is grouping in plot areas because gandaria trees grow among other adjacent plants so that the distance between gandaria plants is limited by other plants. This also happens in the propagation process, more tillers grow close to the parent plant so that the growth process will be grouped within the region.

CONCLUSION

The population density of gandaria in Rumahtiga village is 0.04 ind/m2, which means it is found 1 individual every 25 m2 with a group distribution pattern indicated by the Morisita index value of 7.006. Factors that caused a reduction in the gandaria plant population in Rumahtiga village were fires, land conversion, changes in plant species, increased population growth, lack of sunlight, land characteristics (temperature, altitude, rainfall, soil moisture, drainage, soil texture, and soil reaction (pH).

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