

IDENTIFICATION OF DURIAN TREE HEALTH (*Durio zibethinus*) IN THE PROSPECTIVE NUSANTARA GARDEN WAN ABDUL RACHMAN LAMPUNG INDONESIA

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ABSTRACT

Durian tree (*Durio zibethinus*) is one of the Multipurpose Tree Species are plants that are most widely planted by people in the Wan Abdul Rachman Grand Forest Park (Tahura WAR). The durian species (*Durio zibethinus*) that exist in the Tahura WAR are local species that have been around for generations and are cultivated in traditional ways. This research was conducted to assess the health level of durian trees (*Durio zibethinus*) in the prospective Garden Nusantara Tahura WAR. The steps in this research were determining measurement plots, making measurement plots, data collection, tree inventory, tree health identification, and data analysis. Based on the results of the study, it was found that the number of durian trees (*Durio zibethinus*) successfully inventoried amounted to 182 stems. Of the 10 cluster plots that had been made, the most often found damage to durian plants (*Durio zibethinus*) are open wounds, leaves, shoots/buds damaged, and broken/dead branches. Then, the most often found locations of damage were in the leaves, the top and bottom of the stem and the branches. This study concludes that the number of Durian trees (*Durio zibethinus*) out of a total of 10 clusters is 182 trunks and the health levels of durian trees (*Durio zibethinus*) in the prospective Garden Nusantara Tahura WAR are 60% good, 30% medium and 10% bad. In general, the health of trees is categorized as the medium with an average NKH value of 1.75.

Keywords: *Durio zibethinus*; ecosystem; local species; Forest Health Monitoring.

INTRODUCTION

Wan Abdul Rachman Grand Forest Park (Tahura WAR) is a conservation area based on the government's provisions. Tahura is a nature conservation area to collect natural or artificial plants and/or animals, native and/or non-native species, which are utilized for research, science, education, supporting culture, culture, tourism, and recreation purposes (Law No. 5 of 1990). The Tahura WAR area is divided into three blocks, namely: utilization block covering 3,213.31 ha; protection block covering 4,641.03 ha; and other blocks covering 14,387.84 ha Regional Technical Implementation Unit (UPTD) of Tahura WAR, 2016). The community manages the Tahura WAR utilization block by cultivating forestry, agriculture, and multi-purpose tree species (MPTS) [1]. One of the most commonly grown MPTS plants by the people in the Tahura WAR region is the durian plant (*Durio zibethinus*).

The durian plant found in Tahura WAR is a type of local durian that has existed from generation to generation and is cultivated in a way that is still simple (traditional) [1]. Therefore, durian plants are considered unique plants in Tahura WAR, so they must be maintained and preserved. On the other hand, Tahura WAR has the potential to be developed as a location for research, education, tourism, and recreation. Regional Research and Development Agency (BAPPEDA), Lampung Province (2017), states that an astronomical observatory will be built on Mount Betung, Tahura WAR. In this case, the area leading to and around the astronomical observatory will be developed into a tourist area. Therefore, BAPPEDA of Lampung Province through the Forestry Service of Lampung Province, in particular, the Tahura WAR UPTD will develop recreational facilities and infrastructure for Tahura WAR based on astronomical education, one of which is the creation of the Garden (Park) Nusantara Tahura WAR.

In the making of Garden Nusantara Tahura WAR, it is necessary to collect data on the existing conditions and health of various types of constituent trees, especially durian trees (*Durio zibethinus*) that exist in the area leading to and around the astronomical observatory of the Tahura

WAR. The activity is needed to obtain data and information about the number of durian trees (*Durio zibethinus*) and the health condition status of durian trees (*Durio zibethinus*) that are in the area leading to and around the astronomical observatory of Tahura WAR. The Tahura WAR manager needs the data and information in making management decisions, especially in making Garden Nusantara. To support this, tree inventory activities and identification of durian tree health (*Durio zibethinus*) in the prospective Garden Nusantara Tahura WAR was needed.

RESEARCH METHODS

Time and Place of Research

This research was carried out in the three months, namely from August to October 2019, which was located in the prospective area of Garden Nusantara Tahura WAR.

Tools and Materials

The tools used were tape meters, meter meters, GPS (Global Positioning System), digital cameras, tally sheets, and tree labels. The object of research as research material was the durian trees (*Durio zibethinus*) which were in the location of the prospective Garden Nusantara

Research Methods

Identification of the health of the durian tree (*Durio zibethinus*) was carried out by measuring the tree's damage index (IK). Measurement of the IK of durian trees (*Durio zibethinus*) is based on the Forest Health Monitoring (FHM) method [2,3]. Measurements were made on the FHM plot cluster that had been built. Measurement of the IK of durian trees (*Durio zibethinus*) using the FHM method is determined based on the location of the damage, the type of damage, and the severity threshold [4]. The location of tree damage was measured based on the location where the damage was found, at: roots, stems, branches, crowns, leaves, shoots, and shoots using the FHM method [5]. The types of tree damage present in each part of the tree are assessed based on the level of severity threshold. The type of damage will be assessed if it meets a predetermined threshold of

Table 1. Weighting values for each location code, type, and tree severity / damage

Tree damage location code	Weighted value (x)	Tree damage type code	Weighted value (y)	Tree severity / damage code	Weighted value (z)
0	0	01, 26	1.9	0	1.5
1	2.0	02	1.7	1	1.1
2	2.0	03, 04	1.5	2	1.2
3	1.8	05	2.0	3	1.3
4	1.8	06	1.5	4	1.4
5	1.6	11	2.0	5	1.5
6	1.2	12	1.6	6	1.6
7	1.0	13, 20	1.5	7	1.7
8	1.0	21	1.3	8	1.8
9	1.0	22, 23, 24, 25, 31	1.0	9	1.9

severity. If the damage does not meet the threshold of severity, then the damage is considered not to interfere with the physiological function of the tree. Severity threshold values were coded according to severity threshold classes. The severity threshold value is assessed as the percentage of tree damage severity [6]. Identification of the health of the durian tree (*Durio zibethinus*) is determined based on the damaged condition of the durian tree (*Durio zibethinus*).

Weights for each code of damage location, type of damage, and tree severity / damage [7,8] are presented in Table 1.

The tree level damage condition (Tree Level Index-TLI) is obtained based on the IK value on each durian tree (*Durio zibethinus*) with the formula:

$$TLI = [IK1]+[IK2]+[IK3]$$

The value of the tree health status (NKP) of durian (*Durio zibethinus*) is obtained from the final value of tree level damage conditions. The final tree-level damage condition score is the product of the weighted value and the tree-level damage score

for each cluster-plot. The health status category of the durian tree (*Durio zibethinus*) consists of 3 (three) classes, namely: good, moderate, and bad [9]. The health status category of the durian tree (*Durio zibethinus*) is obtained from the health threshold value of the durian tree (*Durio zibethinus*). The health threshold value of the durian tree (*Durio zibethinus*) was obtained based on the highest and lowest value of the final health value of the durian tree (*Durio zibethinus*) in each cluster-plot.

RESULTS AND DISCUSSION

Number and Distribution of Durian Trees (*Durio zibethinus*)

The results showed that each cluster plot had a different number of Durian (*Durio zibethinus*) trees. The cluster plot that had the most number of trees was found in the first cluster plot. Besides, the plot cluster that has the fewest number of trees was the 7th cluster plot. From a total of 10 cluster plots that had been made, the total number of Durian (*Durio zibethinus*) trees that had been successfully inventoried was 182 stems with the distribution of plots in Table 2.

Table 2. Number of trees in each cluster plot

Cluster Plot	Plot				The number of Durian Trees
	1	2	3	4	
1	5	13	9	4	31
2	3	4	4	10	21
3	7	6	5	5	23
4	7	5	4	11	27
5	6	4	4	6	20
6	3	0	7	0	10
7	0	6	0	0	6
8	9	5	4	3	21
9	3	5	4	1	13
10	2	1	5	2	10
The Total Number of Durian Trees					182

Tree health identification based on the location of damage, type of damage, and threshold value of severity can describe tree vitality [6].

Tree Damage Type

The type of tree damage is a form of plant growth disorder whose symptoms can be seen from the shape, size, color, and texture. According to Pertiwi et al. [10], disruption of tree damage occurs due to the disruption of physiological processes caused by diseases, insects, and other abiotic causes. Safe' i et al. [5], Safe' i, and Tsani [11] describe the types of tree damage as many as 17 types of damage. In this study, there were six types of damage based on the description. The types of damage encountered and the number of trees experiencing symptoms of damage are shown in Fig. 1.

The most frequently damaged types found were open wounds on the trunk of the durian tree (*Durio zibethinus*), the lower part and the upper part. An open wound is a wound or series of wounds that are shown by peeling off the skin or

the inside part of the wood has opened, and there is no sign of further weathering [12]. Some damages to open wounds found were due to human activities.

Location of Damage Found

The location of the tree damage illustrates the location or position of tree damage. The results show that the most location where the damage occurred was at the leaves in the 99 trees. Meanwhile, the location of the least location where the damage occurred was at the trunk of 11 trees. According to Safe'i et al. [13], locations of tree damage recorded at roots, stems, branches, crowns, leaves, shoots, and buds. The number of trees and locations of tree damage can be seen in Fig. 2.

Fig. 2 above shows that the most common damage is found in the leaves and then followed in the upper stems. The tree damage location is useful for identifying the type of tree damage that occurs because each location of damage has different characteristics or types of damage symptoms.

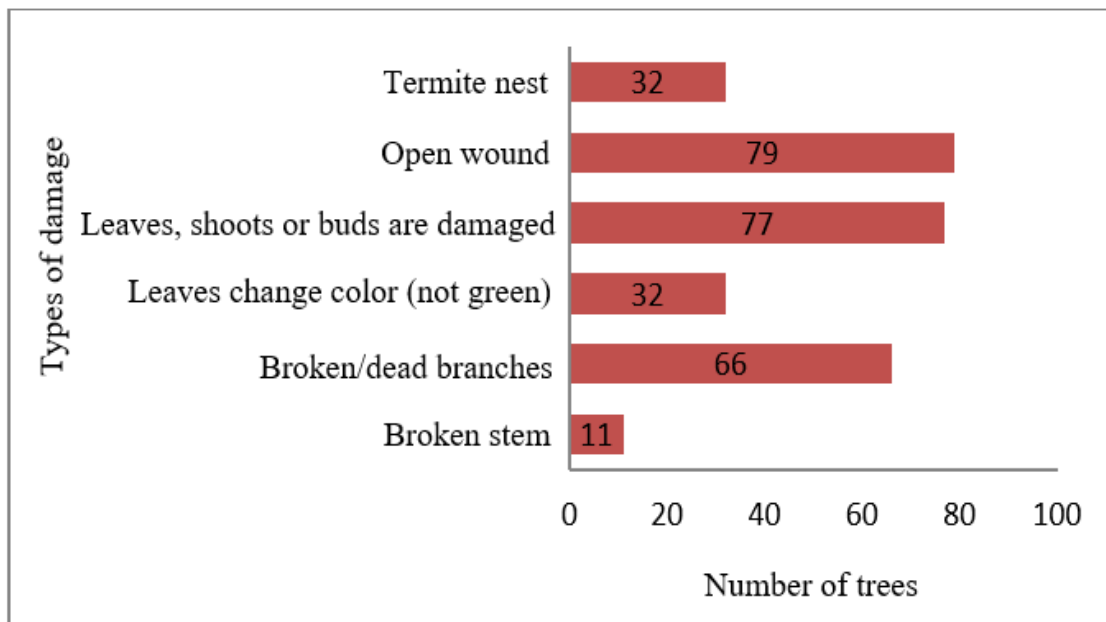


Fig. 1. Number of trees and types of tree damage that occurred at the study site

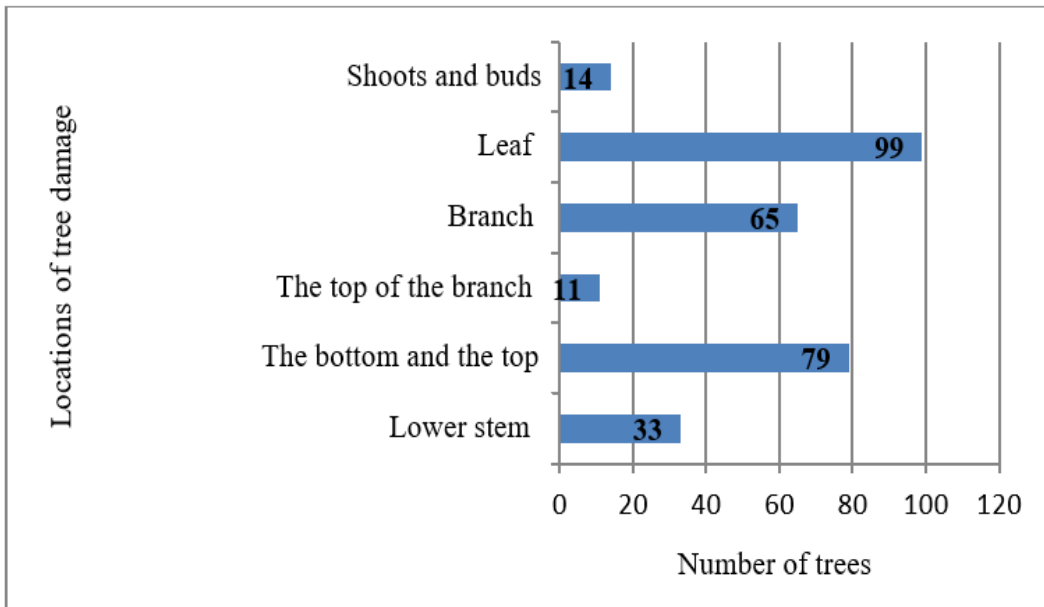


Fig. 2. Number of trees and location of tree damage

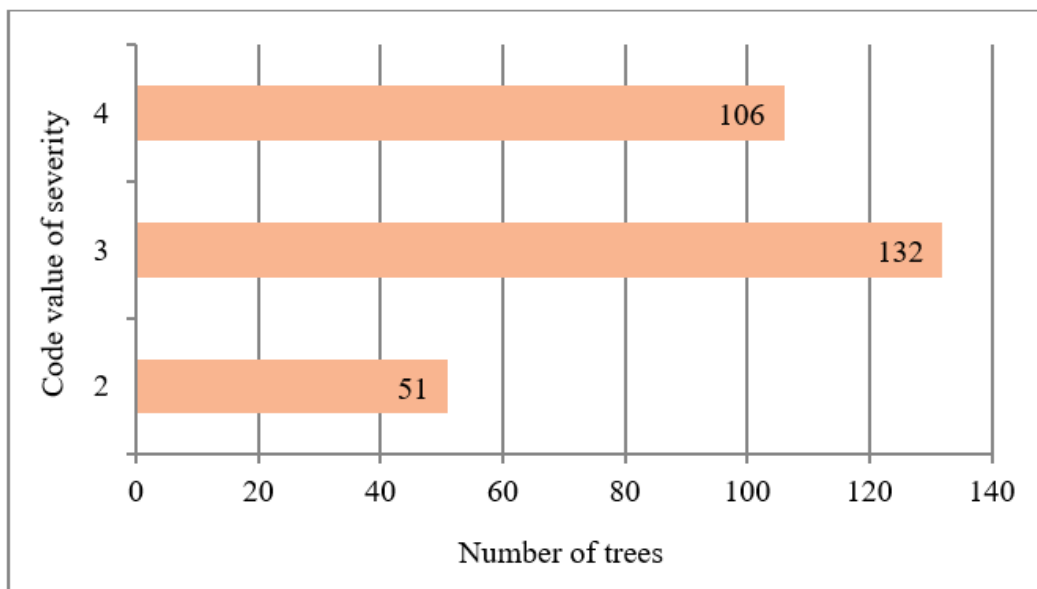


Fig. 3. Number of trees and the value of the threshold value of the durian tree damage (*Durio zibethinus*)

Severity Threshold Value

The severity threshold value is a value that describes the amount of the severity of a type of damage; the severity threshold value is used to

record the type of damage to the tree. If it meets the severity threshold, the type of damage to the tree is recorded, but if it does not meet the severity threshold value, it is not recorded. The highest severity threshold code occurs in code 3 with a

severity threshold value class of 30% -39%, the second occurs in the severity threshold code 4 with a severity threshold value of 40% -49% and the least occurs in the severity threshold value code 2 with a grade of 20% -29% severity. The number of trees and the severity threshold code that occurs at the study site can be seen in Fig. 3.

Tree Health Status in Prospective Garden Nusantara Tahura WAR

The value of tree health status was obtained by the NKP formula, which is the number of multiplications between the weighted value of tree damage of 0.274 and the value of durian tree

damage score [5]. The value of tree health status with three tree health categories can be seen in Table 3. The percentage of tree health conditions can be seen in Fig. 4.

The category of tree health conditions in the prospective Garden Nusantara Tahura WAR is included in the medium category, with an average NKP value of 1.75. The final value of tree health conditions was influenced by the size of the weighted value and the value of each parameter. According to Safe'i et al. [13] the higher the weighted value and the score of each parameter, the higher the final health condition of the forest.

Table 3. The value of tree health status (NKP) and tree health category

Plot Cluster	NKP	Category
1	0.27	Bad
2	1.92	Good
3	1.92	Good
4	1.64	Medium
5	1.92	Good
6	2.19	Good
7	2.74	Good
8	1.64	Medium
9	1.92	Good
10	1.37	Medium

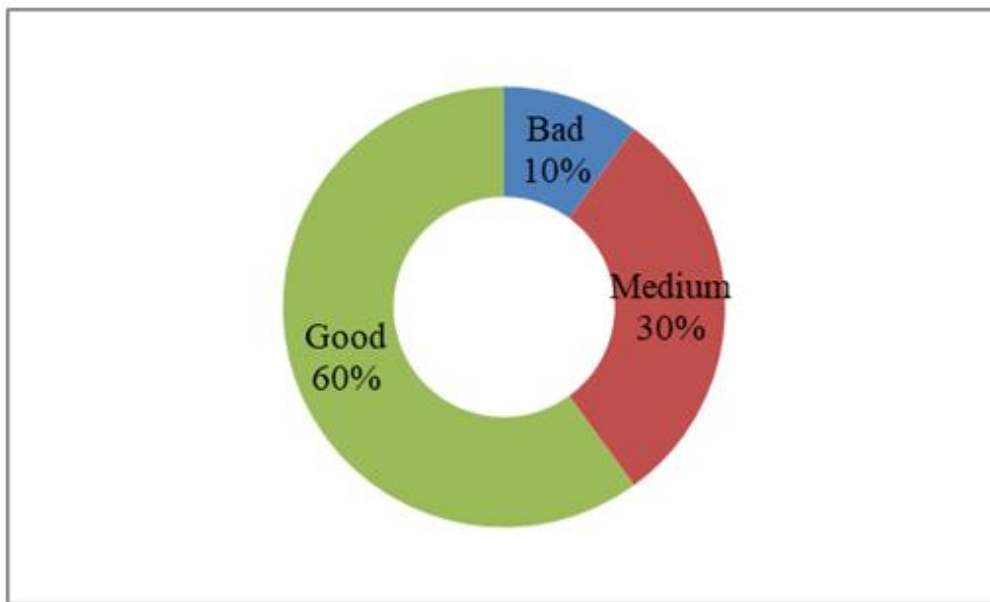


Fig. 4. Percentage of tree health status in prospective nusantara garden Tahura WAR

CONCLUSIONS AND SUGGESTIONS

The conclusion from the research in the prospective Garden Nusantara Tahura WAR is that there are 182 individual durian trees (*Durio zibethinus*) in the 10 cluster plots that have been made. The health level of the durian tree (*Durio zibethinus*) in the prospective Garden Nusantara Tahura WAR is 60% good, 30% medium, and 10% bad. In general, the level of health of trees is categorized as a medium with an average NKP value of 1.75. Therefore, the health conditions of the Prospective Garden Nusantara is hopefully maintained. Suggestions that can be given are to implement integrated management for the good conditions for the Garden Nusantara that will be established.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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