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Classification of Standing Types at PT. Work Locations. Sustainable Forest Tusam in Krakap Dusun, Umang Village, Linge District, Central Aceh District

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A B S T R A C T

PT. Tusam Hutani Lestari is a company with an area of ± 97,300 Ha which has an Industrial Plantation Forest Concession Rights permit number 452/Kpts-11/92 dated 14 May in Aceh Province which is in the districts of Central Aceh, North Aceh, Bener Meriah and Bireuen. With a large working area, the forest area is divided into 6 working blocks, namely the Mount Salak block, Blangkuyu block, Lampahan block, Burni Telong block, Bidin block and Jambu Aye block, making this area have varied biodiversity. This observation aims to determine the diversity of types of stand distribution found on mixed forest land and to determine the value of the important value index (INP) for a type of stand at the PT work site. Tusam Sustainable Forest. The results show that there are 8 types of stands or trees with a total of 17 individuals in the mixed forest area. The dominant important value index (INP) is found in Eucalyptus trees at 60.57% and Pine at 58.66%, while the INP for all plant types in mixed forest area cover is 300% and is included in the high value, and the diversity index for the growth rate of mixed forest land cover shows that the PT Tusam Hutani Lestari work area is included in the medium criteria.

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INTRODUCTION

Based on Law Number 41 of 1999 concerning Forestry, a forest is an ecosystem unit in the form of an expanse of land containing biological natural resources dominated by trees in a natural environment, one of which cannot be separated from the other. Forests are also natural resources that provide great benefits for human welfare, both tangible benefits that are felt directly and intangible benefits that are felt indirectly (Fauzi, 2010). Forests are one of the natural resources that are important for the continuity of human life. Apart from functioning as a habitat for various species of flora and fauna, forests also act as providers of natural resources such as wood, medicines and other non-timber forest products. Apart from that, forests also function as carbon absorbers and provide oxygen needed by humans and other living creatures. Even though they have many benefits, forests are often destroyed and degraded due to human activities such as illegal logging, clearing of agricultural land and mining. This has an impact on reducing the area and quality of forests and threatens the sustainability of the ecosystems within them (Fauzi, 2008).

To ensure forest sustainability, good and sustainable forest management efforts need to be made. Forest management includes forest monitoring and supervision activities, developing policies and regulations related to forests, as well as developing technology and innovation in forest management. Therefore, research on forests and their management is very important to maintain the sustainability of forests and the ecosystems within them. This research can be carried out through various methods such as remote sensing, field measurements, and spatial data analysis. By conducting good and sustainable research, it is hoped that solutions can be found to maintain the sustainability of forests and their benefits for human life and other living creatures (Cahyono et al. 2019).

LITERATURE REVIEW

Biodiversity is all living things on earth that act as indicators and means of ecological systems and species changes. Biodiversity also involves species richness and complex ecosystems so that it can influence communities of organisms, stability and development of ecosystems (Rahayu et al., 2017). Biodiversity is all living creatures such as plants, animals, fungi and microorganisms as well as various genetic materials that exist as well as the diversity of ecological systems where living creatures live (Wati et al., 2016). High species diversity indicates that a community has high complexity because in that community there is high species interaction. So, in a community that has a high diversity of community types, there will be species interactions involving energy transfer (food web), predation, competition and niche division which theoretically is more complex (Soegianto, 1994). Important information that must be available in forest management is biodiversity, trees can be used as a parameter of biodiversity in an ecosystem. A tree is a stand that dominates a forest, and functions as a producer organism and a residence for various types of animals (Wahyudi 2014).

Trees use sunlight to carry out photosynthesis, so they can adapt CO2 and H2O to produce chemical energy in the form of carbohydrates and release

oxygen which living creatures use for the respiratory process. Tree diversity can be used as an indicator of community level, stating that community structure and tree diversity can also be used to measure community stability, namely the strength of a community to maintain a stable ecosystem despite disturbances to its components (Indriyanto, 2006). This observation aims to determine the diversity of types of stand distribution found on mixed forest land and to determine the value of the important value index (INP) for a type of stand at the PT work site. Tusam Sustainable Forest.

METHODOLOGY

The study was carried out from January 2023 to February 2023. The study location was in Central Aceh Regency, Linge District, Umang Village and Krakap Hamlet, precisely in one of PT's working areas. Tusam Sustainable Forest. The materials and tools used are forest areas which are standing areas planted by PT. Tusam Sustainable Forest. The methods used in this study were preparation, data collection and data analysis.

1. **Preparation**: The initial step that can be taken is preparation, such as determining the data collection location that suits the needs for implementing skills practice, and then carrying out initial observations and assessments at the data collection location. The next step is selecting the equipment needed, such as meters, roll meters, and Global Positioning. System (GPS), stationery, machete, camera, scissors, calculator and the materials used in this research were raffia rope and observation sheets (Tally sheet).
2. **Data Collection**: When collecting data, what is needed is to identify the types of stands at the PT work location. Sustainable Forest Tusam has been determined and measured the diameter at breast height and stand height (TH) for each type of stand obtained during observations. The next step is to record the measurement results data in a prepared observation sheet or Tally sheet.
3. **Data Analysis**: Analysis of the data used in the research using Microsoft Excel is by looking for density, frequency, dominance, important value index (INP), species diversity index, species richness, and species evenness (Fachrul, 2007). The Important Value Index (INP) is used to analyze the dominant species in an area (Indriyanto, 2006).

Density

Density is the number of individuals of each species found in a sample plot. The density of each plant species is calculated using the formula:

Absolute Density (K) : $K = \frac{Number\ of\ Individuals\ of\ a\ species}{Sample\ plot\ area}$

Relative Density (KR) : $KR = \frac{Density\ of\ a\ species}{Total\ total\ density}\ x\ 100$

Frequency

Frequency is the number of occurrences of each species found in all sample plots created. Species frequency can be calculated using the formula:

Absolute Frequency (F) : $F = \frac{Number\ of\ sample\ plots\ occupied\ by\ the\ species}{Number\ of\ sample\ plots}$

Relative Frequency (FR) : $FR = \frac{Frequency\ of\ a\ species}{The\ total\ frequency\ of\ a\ species}\ x\ 100$

Dominansi

Dominance is the area of the tree base or the area of canopy cover for each species found in the plot. Dominance can be measured by the formula:

Absolute Dominance : $D = \frac{The\ total\ basal\ area\ of\ the\ species}{the\ total\ area\ of\ the\ sample\ plot}$

Relative Dominance (DR):DR = $\frac{Dominance\ of\ the\ basal\ area\ of\ the\ species}{Total\ dominance\ of\ all\ species}\ x\ 100$

This important value index shows the species that dominate in the research location. To calculate the Important Value Index, the formula is used:

Stake, pole and tree level INP = KR (%) + FR (%) + DR (%)

RESULT AND DISCUSSION

A. General Description

PT. Tusam Hutani Lestari is located in Central Aceh, North Aceh, Bener Meriah and Bireuen Regencies, Aceh Province with an area of ± 97,300 Ha. From an area of ± 97,300 hectares, the whole is included in the Jambu Air Watershed Forest Group which is located in 4 (four) districts, namely Central Aceh, North Aceh, Bireuen and Bener Meriah districts, Nanggroe Aceh Darussalam Province. Based on the interpretation of the 2010 Landsat Image Map covered on January 14, 2009, the condition of land cover in the PT work area. Tusam Hutani Lestari which has an area of ± 97,300 hectares consists of limited production forest (HPT) covering an area of 3,081 hectares, permanent production forest (HP) covering an area of 80,950 hectares, another use area (APL) of 5,368 hectares, protected forest buffer area (HL) covering an area of 689 hectares and a hunting park buffer area (TB) covering an area of 7,211 hectares. From an area of ±97,300 hectares, the business permit locations are divided into 6 blocks, namely:

Table 1. Location of PT. Business Permits Lestasi Forest Tusam

Block	Block Name	Coordinate		Block Area
I	Gunung Salak	04° 57' 20" - 05° 04' 15" LU	96° 45'56"- 97° 11' 31" BT	13.023 Ha
II	Blangkuyu	04° 48' 52" - 04° 57' 13" LU	96° 33'32"- 96° 44' 22" BT	14.372 Ha
III	Lampahan	04° 38' 28" - 04° 46' 21" LU	96° 41'14"- 96° 46' 03" BT	9.987 Ha
IV	Burni Telong	04° 42' 15" - 04° 44' 44" LU	96° 48'15"- 96° 52' 00" BT	1.309 Ha
V	Bidin	04° 40' 25" - 04° 47' 16" LU	96° 45'56"- 97° 11' 31" BT	17.527 Ha
VI	Jambu Aye	04° 17' 38" - 04° 30' 23" LU	96° 46'05"- 97° 14' 23" BT	43.084 Ha

PT. Tusam Hutani Lestari is a joint venture between PT. Inhutani IV (Persero) and PT. Alas, Helau, obtained a Business Permit for the Utilization of Timber Forest Products, and Plantation Forests in Nanggroe Aceh Darussalam Province covering an area of ± 97,300 hectares. The operational history of PT Tusam Hutani Lestari in the development of plantation forests is divided into 4 (four) periods, namely the period before the establishment of the joint venture, the operational period until 2003, the period from 2004 to 2007 and the period from 2007 to the present after the Imposition of the Logging Moratorium by Regional Government of Nanggroe Aceh Darussalam Province. This activity has been started since 1994 in the work area by the reservation given by the Minister of Forestry to PT. Alas, Helau through Decree number 452/KptsII/1992 dated 14 May 1992 covering an area of ± 175,000 Ha and obtained definitive permission through Decree of the Minister of Forestry number 556/KptsII/1997 dated 01 September 1997 concerning the Granting of Industrial Plantation Forest Concession Rights (HPHTI) to PT. Tusam Hutani Lestari covers an area of 97,300 hectares located in the Special Region of Aceh Province (now Nanggroe Aceh Darussalam Province) with work areas covering Bireun Regency, North Aceh Regency, Bener Meriah Regency and Central Aceh Regency. Since the start of operations of PT. Tusam Hutani Lestari from 1994 to mid-2000, PT. Tusam Hutani Lestari has carried out planting activities in an area of ± 13,600 hectares.

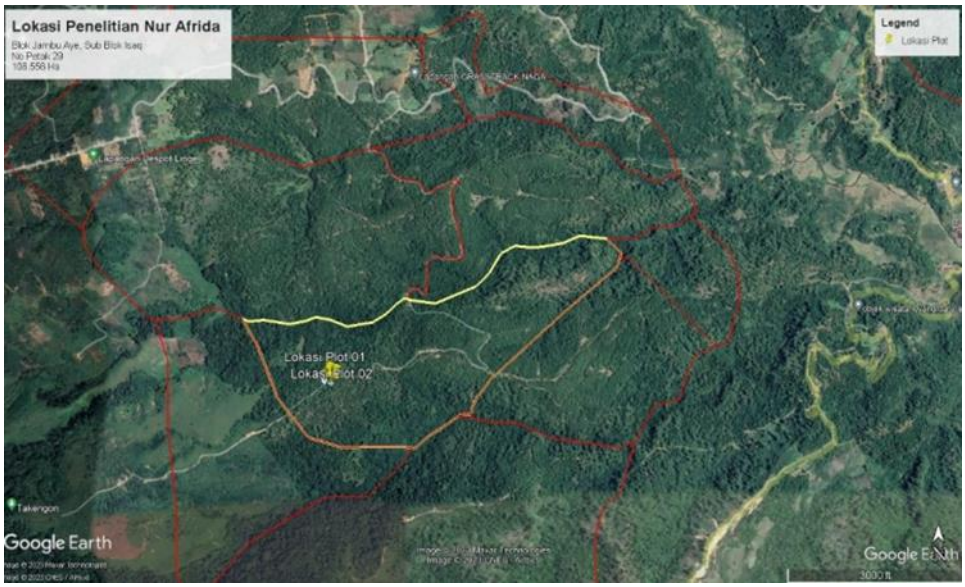

Figure 1. Research Location

B. Stand Composition in Mixed Forest Areas

A mixed forest is a type of forest that consists of several types of trees that grow together in one area or location. Mixed forests can consist of trees of different species or the same type of tree but of different ages or levels of maturity. Mixed forests are usually found in areas that have climatic conditions that support the growth of various types of trees. Tree types that grow in mixed forests usually have different characteristics, such as root type, leaf size, tree height, and growth rate. This makes mixed forests very complex ecosystems (Peran et al. 2021).

The existence of mixed forests has important ecological value because it has various benefits for the environment and ecosystem sustainability. Some of the benefits of mixed forests include: (1) maintaining biodiversity because the various types of trees that grow in them provide a place to live for various types of flora and fauna. (2) produce wood and other raw materials, such as rattan, bamboo, or rubber latex. (3) helps maintain climate and water stability, because mixed forests can absorb carbon dioxide gas and produce oxygen. (4) helps prevent soil erosion and natural disasters, because tree roots in mixed forests can hold the soil and reduce surface water flow. (5) provide a place for recreation and tourism, because the beauty and biodiversity in mixed forests can attract tourists to visit. However, on the other hand, mixed forests can also face various problems, such as deforestation, land degradation and environmental damage due to human activities such as illegal logging and forest burning. Therefore, it is important to maintain the existence of mixed forests in sustainable ways and pay attention to aspects of conservation and ecosystem sustainability.

Based on the results of research carried out by taking samples from 2 plots in the mixed forest area, 8 species of trees were found in plots 1 and 2. The composition of the stand types in Plots 1 and 2 had different diameters at the PT Tusam Hutani Lestari work location in Krakap Hamlet, Umang Village, Linge

District, Central Aceh Regency with mixed forest cover. The composition of tree species in mixed forests is presented in Table 2.

Table 2. Composition of Tree Species in Mixed Forests

No	Species name	Latin name	Growth phase	amount
1	Bintangur	*Calophyylum* spp	Tree	2
2	Bayur	*Pterospermum* spp	Tree	4
3	Sukun hutan	*Artocarpus altilis*	Tree	1
4	Ekaliptus	*Eucalyptus* spp	Tree	3
5	Gerugang	*Cratoxylum* spp	Tree	2
6	Pinus	*Pinus mercusii*	Tree	2
7	Gempol	*Nauclea* spp	Tree	2
8	Bipa	*Pterygota* spp	Tree	1
	Total			**17**

Based on Table 1, shows that the Bayur tree species dominates with 4 trees found in the 2 sample plots conducted in the research, while the fewest plant types in this research location are Forest Breadfruit and Bipa plants where each type of plant is 1 in number. two plots were examined. According to Hidayat (2017), bay trees are distributed in environments with heights below 1,000 meters above sea level. Pterospermum javanicum lives in forests, lowlands, secondary forests, riverside forests, coastal areas, gardens, yards or empty gardens. What's more, your trees can grow in areas of moist soil and not flooded with water. In certain areas, Bayer (Pterospermum javanicum) can be found in areas with dry land. Bayur reproduces by utilizing the wind to spread its winged seeds to surrounding areas and grow new shoots into new individuals. Usually, the buyer's habitat is found in areas with clay, wet to slightly dry soil (Peran, 2021). Geographically, Bayer (Pterospermum javanicum) is a flora native to tropical regions. In Indonesia, bay trees grow evenly in lowland areas. If your trees are preserved in the long term, buyers can provide benefits to the surrounding environment. Its fast growth and strong roots can protect groundwater supplies and the potential for soil erosion which can cause landslides. Thus, bay trees are very suitable for the conservation of critical watershed (watershed) land.

C. Importance Value Index

The Importance Value Index of plant species in a community is one of the parameters that shows the role of the plant species in the community. If the INP value of an individual is greater, the greater the level of control over that individual and conversely, if the INP value of an individual is smaller, the level of control over the individual will also be smaller (Sahira, 2016). The presence of a plant species in an area shows its ability to adapt to its habitat and wide tolerance to environmental conditions. The greater the INP value of a species, the greater the level of control over the community and vice versa. Domination of a certain species in a community is if the species in question succeeds in placing most of the available resources compared to other species (Yuliantoro,

2019) and Rawana et al (2022). In Table 3, the results of the important value index for mixed forest land cover are presented.

Table 3. Importance Value Index for Mixed Forest Land Cover

No	Type	Latin name	Amount	KR (%)	FR (%)	DR (%)	INP (%)
1	Bintangur	*Calophyllum* spp	2	11,76	16,67	18,66	47,09
2	Bayur	*Pterospermum* spp	4	23,53	16,67	12,00	52,20
3	Sukun Hutan	*Artocarpus altilis*	1	5,88	8,33	4,42	18,64
4	Ekaliptus	*Eucalyptus* spp	3	17,65	16,67	26,26	60,57
5	Gerunggang	*Cratoxylum* spp	2	11,76	8,33	5,43	25,52
6	Pinus	*Pinus mercusii*	2	11,76	16,67	30,23	58,66
7	Gempol	*Nauclea* spp	2	11,76	8,33	2,02	22,12
8	Bipa	*Pterygota* spp	1	5,88	8,33	0,99	15,20
	Jumlah		17	100	100	100	300

Based on Table 3, shows that the importance index for Eucalyptus species dominates the mixed forest land, namely 60.57% and the lowest value for Bipa trees is 15.20%. In this research location, only 8 tree species were found with 17 individual tree classes. This is because the land used in this research is planting blocks that have old plants so no seedlings, saplings or poles were found. Calculation of the important value index on the research plot resulted in an INP of 300%. This value is included in the high category.

According to Fahrul (2007), the categorization of INP values is as follows: INP > 42.66 is categorized as high, INP 21.96 -42.66 is medium, and INP < 21.96 is categorized as low. The INP value also describes the level of influence of a type of vegetation on ecosystem stability. According to Seameo Biotrop (2013), generally, species that have high INP values can grow and develop in areas that have high soil temperatures and soil acidity levels. Plant species that have an important value index that is higher than others are also because these plant species are quite dominant at several stations and cause their dominance values to be high. Plant species that have high INP are generally distributed throughout the research station.

CONCLUSIONS AND RECOMMENDATIONS

PT Tusam Hutani Lestari's work area is in block 9, precisely in Krakap Hamlet, Umang Village, Linge District, Central Aceh Regency, at the research location, 2 plots have 8 types of stands or trees found in the mixed forest area with a total of 17 individuals. The dominant important value index (INP) is found in Eucalyptus trees at 60.57% and Pine at 58.66%, while the INP for all plant types in mixed forest area cover is 300% and is included in the high value, and the diversity index for the growth rate of mixed forest land cover shows that the PT Tusam Hutani Lestari work area is included in the medium criteria.

FURTHER RESEARCH

This research still has limitations so further research needs to be done on this topic "Classification of Standing Types at PT. Work Locations. Sustainable Forest Tusam in Krakap Dusun, Umang Village, Linge District, Central Aceh District."

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