Analysis of Potential Standing Results from Forest Inventory: Case Study at IPPKH PT Cristian Eka Pratama, West Kutai District, East Kalimantan Province

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ABSTRACT

Inventory is one of the indispensable components in forest management activities. Inventory data forests need to be analyzed so that they can produce information in the form of structure, composition, and stand potential which can be used as a basis preparation of forest regulations and plans management. The research aims to find out information on stand potential based on the type, number, and volume of trees in the lease-to-use forest area of PT. Cristian Eka Pratama West Kutai Regency, East Kalimantan Province, Indonesia. This research was carried out in the Forest Area Borrow-to-Use Permit (IPPKH) area of PT Cristian Eka Pratama West Kutai Regency, East Kalimantan Province from February to April 2023 including making work plans, preparation, data collection, data management, and analysis, and reporting. The results of research with an area of 6 hectares obtained 18 types of trees and the number of trees (N) = 311 and tree volume (V) = 278.22 m^3. For the number of trees per hectare, there are 52 trees and the volume of trees per hectare is 46.37 m^3, the most dominant tree species is *Eugenia* spp with a population of 52 trees and a volume of 16.94 m^3, while the fewest tree species are *Litsea* Blume with a population of 1 tree and a volume of 0.27 m^3; and the population for the most dominant species group is the Shorea wood group with 214 trees and a tree volume of 220.70 m^3, for the mixed jungle wood group there are 93 trees and a volume of 55.95 m^3 and for the beautiful wood group, there are 4 trees and volume of 1.57 m^3.

KEYWORDS:

Analysis of Potential Stands, Inventory.

INTRODUCTION

Forests are natural resources that have a big influence on human life. Humans interact with forests to fulfill their living needs. A forest is a unified ecosystem in the form of an expanse of land containing biological natural resources dominated by trees and a combination of natural environments that cannot be separated from one another [1]. So forests are natural resources that have a direct and indirect influence on human life.

Forests have a very important position and role in supporting national development. Forests as national development capital have real benefits for the lives and livelihoods of the Indonesian people, including ecological, socio-cultural, and economic benefits in a balanced and dynamic manner [2].

To maintain the availability of forest resources in a sustainable manner and reduce the occurrence of conflicts over forest use, correct and accurate information about existing potential is needed, so that later it can be used to determine the extent of policies and plans for managing forest resource potential at the government level without having to ignore livelihood conditions. communities around the forest. In addition, knowledge about the dynamics of forest stands contained in forest land, and efforts to predict the growth of forest products and the possibility of their utilization need to be carried out through forest inventory activities.

Forest inventory is a branch of forestry science that discusses how to measure some or all of the elements of forest land to determine the properties and/or value of the wealth on the forest land in question [3]. The inventory of forest resources consists of an inventory of flora, an inventory of fauna, and environmental services, as well as an inventory of permit areas subject to permits [2]. The results of the inventory in the form of potential and distribution of tree species are very important to know in forest management so that appropriate silvicultural actions are taken. will be carried out by the objectives of sustainable forest management.

PT. Cristian Eka Pratama obtained a Decree from the Head of the Republic of Indonesia Investment Agency Number: SK.279 /1/KLHK/2020 concerning a Borrow-to-Use Forest Area Permit for coal operations and supporting facilities covering an area of ± 680.34 hectares, in a permanent production forest area in West Kutai Regency, East Kalimantan Province.

Several reasons for choosing PT Cristian Eka Pratama as the research object are (1) stand inventory activities (Timber Cruising) covering an area of ± 255.2 Ha will be carried out by statutory provisions. Based on the Regulation of the Minister of Environment and Forestry Number 8 of 2021 dated 1 April 2021 concerning Forest Management and Preparation of Forest Management Plans, as well as Forest Utilization in Protected Forests and Production Forests; (2) Non-Forestry Activity Timber Utilization (PKKNK) is an agreement to cut wood and collect non-timber forest products as a result of non-forestry activities, including from production forest areas that can be converted and have been released, use of forest areas with approval for forest area use. , the right to cultivate and from other use areas that have been granted allocation permits for approving Non-Forestry Activity Timber Utilization (PKKNK) is closely related to Non-Tax State Revenue (PNBP) which consists of Forest Resources Provisions (PSDH) and Reforestation Funds (DR) specifically levied PSDH and DR values depending on production levels and tariffs for each type of wood, and (3) location of PT. Cristian Eka Pratama is located in Tukul Village, Tering District, West Kutai Regency, East Kalimantan Province. This research location is very easy to reach from the capital of West Kutai Regency, it can be reached ± 2 hours by land and river from Melak City.

The research aims to find out information on stand potential based on the type, number, and volume of trees in the lease-to-use forest area of PT. Cristian Eka Pratama West Kutai Regency, East Kalimantan Province, Indonesia.

RESEARCH METHODS

A. Location and Time

This research was carried out in the Forest Area Borrow-to-Use Permit (IPPKH) area of PT Cristian Eka Pratama West Kutai Regency, East Kalimantan Province from February to April 2023 including making work plans, preparation, data collection, data management, and analysis, and reporting.

B. Research Equipment

The tools used consist of a working map, compass, GPS, Clinometer, Phiband, machete for paving the way, measuring book or tally sheet, 20 m long rope, marker, writing utensils, red paint.

C. Research Methods

This research method was carried out by direct observation in the field using the timber cruising technique with a track system with an area of 6 hectares, on the PT Cristian Eka Pratama IPPKH land clearing plan in West Kutai Regency.

D. Research Procedures

1. Study of Literature

Literature study is the activity of studying theories relevant to research and collecting secondary data needed for the activity, in the form of data from the results of research that has been carried out, oral statements, and input from several sources and supervisors.

2. Field Orientation

This field orientation is carried out by collecting initial data in the field. The data collected includes the physical condition of the field to determine the situation and conditions in the field.

3. Path Creation

Determining point 0 (zero) as the starting point in making the inventory route according to the work map by marking the route stakes in the field. The inventory routes are made in a north-south direction and the number of routes is adjusted to the area of the work plot.

4. Measurement of tree diameter and height

The standing inventory was carried out by identifying all types of trees in the PT Cristian Eka Pratama area. The type of tree identified is the type of tree whose diameter is >10 cm, and the measurement of tree height begins with healthy trees and recording field conditions is carried out sequentially on each route in the observation measuring plot. The location for measuring the diameter is at chest height ± 130 cm (approximately one hundred and thirty centimeters) and above the buttresses, if the buttresses are too high, a fall projection line can be made from the trunk of the buttress tree, while measuring the height of the tree is carried out by measuring the total height of this measurement using a tool, namely a clinometer, namely height measuring tool by shooting at the base of the tree and the tip of the tree or buttress up to the first branch. The simple way to measure the diameter of the tree is in Figure 1 below:
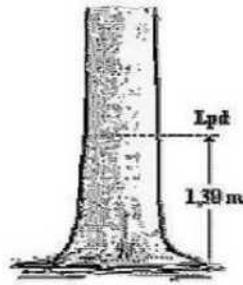
Figure 1. Tree Diameter Measurement

As for simple measurements of tree height, it can be seen in Figure 2 below:
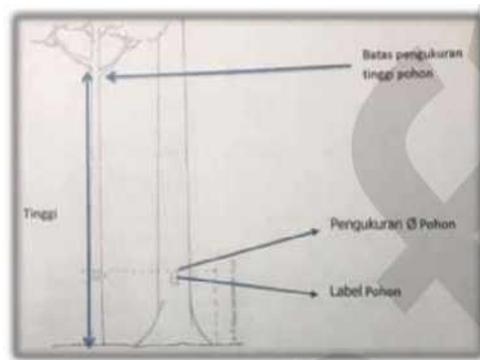

Figure 2. Measurement of tree height

The data that has been taken in the field is then poured into the tally sheet that has been created.

5. Data processing

The grouping of tree types: Large Round Wood (KBB), Medium Round Wood (KBS), and Small Round Wood (KBK) refers to the Decree of the Minister of Forestry Number 163/Kpts-II/2003 dated 26 May 2003 concerning Grouping of Wood Types as a Basis for Imposing Forestry Fees. Calculation of tree volume is calculated using the formula:

$$V = 1/4 \; n \; 0^2 \; x \; t \; x \; 0.6$$

Description : V = volume; n = 3.1415 0 = diameter (cm); t = tree height free of branches and buttresses (meters) 0.6 = shape factor.

E. Data Analysis

Analysis of data from measurements in the field is aimed at obtaining the number of trees (N) and tree volume (V). From the results of carrying out the standing inventory, recapitulation results were obtained based on diameter classes and species groups which refer to the Decree of the Minister of Forestry Number 163/Kpts-II/2003 dated 26 May 2003 concerning Grouping of Wood Types.

RESULTS AND DISCUSSION
A. General Description of the Research Location

PT Cristian Eka Pratama is located at coordinates 115o40'76" E - 115o44'56.83" E and coordinates 0o00'58.68" N - 0o09'02.60" N in the permanent production forest area in the Kampung Tukul area, Tering District, West Kutai Regency, East Kalimantan Province with an area of + 680.34 hectares.
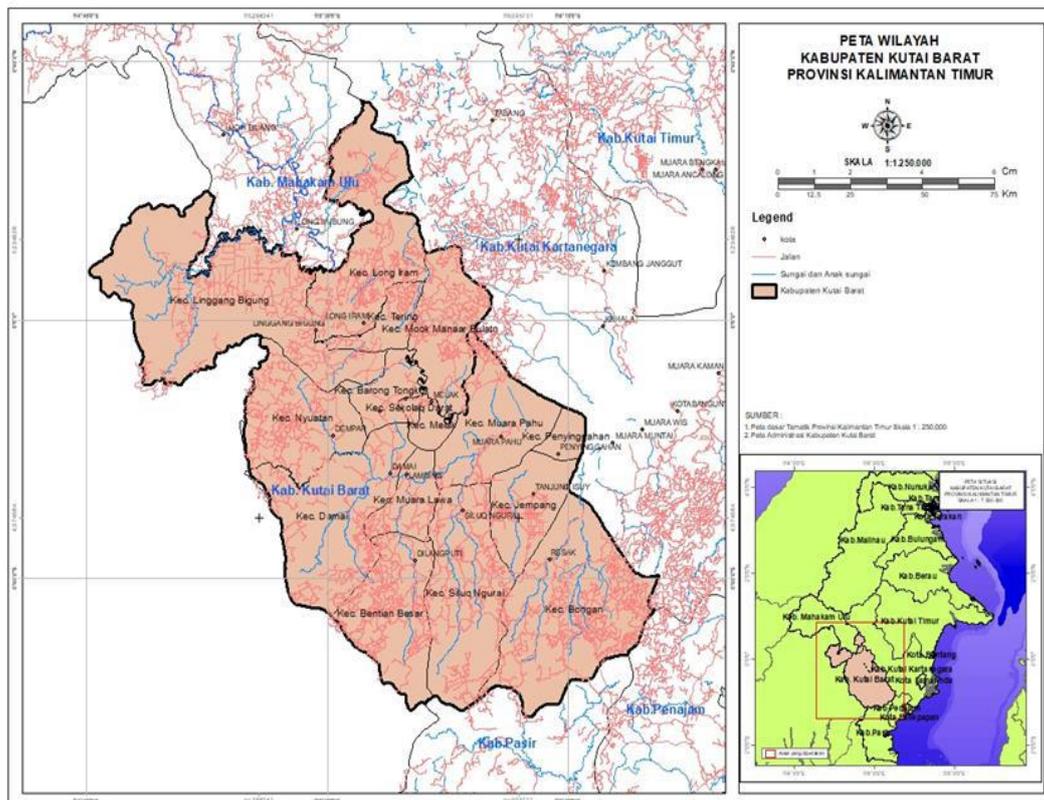
Figure 3. Location of PT. Cristian Eka Pratama in West Kutai Regency tap PTPT in the TukulGamar Village area, Tering District,

The topographic condition of the PT Cristian Eka Pratama location where the stand research was carried out was generally light to moderately wavy, and the condition of secondary dry land cover, and a little open land which was the former network of timber transport roads.

Based on climate data, the West Kutai Regency area is included in the tropical humid climate category, with the highest average rainfall in April and the lowest in August and does not indicate any dry months or throughout the month of the year there is always at least seven rainy days [5].

B. Information on Potential Stands, Types, Number, and Volume of Trees

Based on the results of the inventory of forest stands in the PT Cristian Eka Pratama IPPKH area, they are as follows:

1. Chronology of activities

The area of the plot where the inventory research was carried out was ± 6 hectares, with a path width of 20 m, a path length of ± 3,000 m, and a total of 10 paths.

2. Tree Potential

The results of the inventory of forest stands in the PT Cristian Eka Pratama area are presented in Table 1 below:

Table 1. Recapitulation of Stand Inventory Results at PT Cristian Eka Pratama

NO	Trees Type	Core Trees				50 Cm - Up		TOTAL	
		10 - 29 Cm		30 - 49 Cm					
		N	V	N	V	N	V	N	V
1	**A. Shorea Group**								
	1. Shorea laevis Ridl)	4	0.96	4	3.35	9	22.57	17	26.88
	2. Dryobalanops	16	2.09	6	4.68	5	14.08	27	20.85
	3. Dipterocacpus	12	2.25	7	4.68	5	14.09	24	21.02
	4. Parashorea aptera	-	-	1	0.46	4	8.65	5	9.11
	5. Shorea multiflora	10	1.29	3	2.64	8	18.66	21	22.59
	6. Shorea leprosula	5	1.20	21	15.48	16	44.65	42	61.33
	7. Shorea lepidota	12	2.08	19	16.29	8	20.34	39	38.71
	8. Anisoptera spp	4	0.72	4	2.72	1	2.38	9	5.82
	9. P obtusifolium	-	-	5	3.12	-	-	5	3.12
	10. Vatica rassak	13	2.18	10	6.02	2	3.07	25	11.27
	Number Shorea Group	76	12.77	80	59.44	58	148.49	214	220.70
2	**B. Mixed Jungle Group**								
	1. C formosum	4	0.46	4	2.83	2	3.91	10	7.20
	2. Eugenia spp	34	4.70	15	7.69	3	4.55	52	16.94
	3. K malaccensis	-	-	-	-	2	8.29	2	8.29
	4. Litsea Blume	1	0.27	-	-	-	-	1	0.27
	5. Endospermum spp	1	0.12	1	0.38	1	1.24	3	1.74
	6. Mixed Forest	11	2.14	10	6.06	4	13.31	25	21.51
	Number Mixed Jungle Group	50	7.69	32	18.20	11	30.06	93	55.95
3	**C. Beautiful Wood Group**								
	1. Quercus spp	1	0.32	-	-	-	-	1	0.32
	2. Sindora spp	1	0.16	2	1.09	-	-	3	1.25
	Number Beautiful Wood Group	2	0.48	2	1.09	-	-	4	1.57
	Total (A+B+C)	128	20.94	114	78.73	69	178.55	311	278.22

Source: processed data

Based on Table 1 above, shows that the results of the standing inventory for the 10 cm to 50 cm Up diameter class contained 18 tree species with a total of 311 trees and a total tree volume of 278.22 m^3, with the following details:

1. The shorea wood group consists of 10 species with some trees (N) = 214 trees and tree volume (V) = 220.70 m^3.
2. The mixed jungle wood group consists of 6 species with some trees (N) = 93 trees and tree volume (V) = 55.95 m^3.
3. The beautiful wood group consists of 2 types with some trees (N) = 4 trees and tree volume (V) = 1.57 m^3.

The Shorea group consists of 10 types, and the most dominant types are *Shorea leprosula*(42 trees with a volume of 61.33 m^3) and *Shorea lepidota*(39 trees with a volume of 38.71 m^3), while the fewest types are *Parashorea aptera*(5 trees with a volume of 9.11 m^3) and *P. obtusifolium*(5 trees with a volume of 3.12 m^3).

The mixed forest group consists of 6 species, and the most dominant species is *Eugenia* spp (52 trees with a volume of 16.94 m^3) followed by mixed forest with 25 trees with a volume of 21.51 m^3), *C formosum* type (10 trees with a volume of 7.20 m^3), and the fewest species are *Litsea* Blume(1 tree with a volume of 0.27 m^3); and the beautiful wood group consists of 2 types, namely *Sindora spp*(3 trees with a volume of 1.25 m^3) and *Quercus spp*(1 tree with a volume of 0.32 m^3). According to the results of the research reported by [6] the dominant stand types in the West Berau Model KPHP are meranti with 1,319 stems, *Litsea* Blumewith 545 stems, and *Eugenia* spp with 378 stems. The largest average volume per hectare is the meranti type with 55,929 m^3/Ha, *Litsea blume* with 13,230 m^3/Ha, and *Dipterocarpus grandifloras*with 12,574 m^3/Ha. The *Dipterocarpus grandifloras*type has greater potential per hectare even though the quantity (N) is smaller than the *Eugenis* spp type. The results of other research reported by [7] stated that the results of forest inventory at KPHP Nunukan Unit IV on 50 plots showed that the number of species/types found was 76 species, which was dominated by Shorea with an average volume of 175.31 m^3 /Ha. For stand structure, it is known that the total number of trees found was 137 stems/ha and a volume of 245.01 m^3/ha and the dominant species was Shorea, namely 90 stems/ha with a volume of 175.31 m^3/ha. [8] explained that a species will be dominant in a community if that species succeeds in utilizing some of the existing resources compared to other species. The value of the Important Value Index depends on density, frequency, and dominance. Furthermore, it was stated by [9] that the dominant type has a higher level of suitability to the environment than other types.

The results of the research also showed that in the Shorea group, there were 2 types with the smallest numbers, namely *Parashorea aptera*and *P obtusifolium*with only 5 trees; In the mixed forest group, 3 types were found which were small in number, namely *Endospermum spp*(3 trees), *K malaccensis*(2 trees)and*Litsea*blume(1 tree); and in the beautiful wood group, only 2 types were found, namely *Sindora spp*(3 trees) and *Quercus spp*(1 tree). This was explained by [10] that the distribution pattern of trees in nature is rarely found in a uniform (regular) pattern, but generally has a clustered pattern. Differences in distribution patterns for each type of tree are due to the influence of environmental factors and disturbances from mature individuals, namely the felling of tree species, both legal and illegal. Climatic conditions and nutrient availability factors are environmental factors that play a big role in the spread. In addition, the pattern of fruit spread is through water, wind, and animals, so the distribution pattern is different for each type. It was stated by [11] that individuals will group in certain places that are more profitable. This is likely due to mutually beneficial interactions between

these individuals. Furthermore, according to [12] competition or competition affects an individual's ability to survive and reproduce, and can be shown by changes in population sizes at any one time.

CONCLUSIONS AND RECOMMENDATIONS
A. Conclusion

Based on the results of research and discussion, conclusions can be drawn as follows:

1. The results of research in the PT Cristian Eka Pratama area with an area of 6 hectares obtained 18 types of trees and the number of trees (N) = 311 and tree volume (V) = 278.22 m^3.

2. For the number of trees per hectare, there are 52 trees and the volume of trees per hectare is 46.37 m^3, the most dominant tree species is the *Eugenia* spp with a population of 52 trees and a volume of 16.94 m^3, while the fewest tree species are *Litsea* Blumewith a population of 1 tree and a volume of 0.27 m^3.

3. The population for the most dominant species group is the Shorea wood group with 214 trees and a

tree volume of 220.70 m^3, for the mixed jungle wood group there are 93 trees and a volume of 55.95 m^3 and for the beautiful wood group there are 4 trees and volume of 1.57 m^3.

B. Suggestions

1. The management of PT Crisitian Eka Pratama needs to make efforts to protect forests and empower communities around the forest to always maintain forest sustainability.

2. Carrying out outreach and education activities to the community around the Company's location about the importance of preserving forests.

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