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Test Results Bengkirai Log (Shorea Laevis Ridl) in IPHHK CV. Mustika Sari in West Kutai Regency, East Kalimantan Province

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Abstract:
Background*: The purpose of this study was to examine the yield of sawmills in IPHHK CV. Mustika Sari and the effect of wood defects on yield value.The research was carried out in the Wood Forest Products Primary Industry, CV. Mustika Sari with research materials in the form of logs of the type Bangkirai (Shorea laevis), with the number of each class of log diameter as much as 5 sticks. The logs are measured to determine the diameter, length, and volume and then tested to determine the quality. Sawing results in the form of sawn wood are measured based on the size of the sorties and calculated to determine the yield produced.*
Materials and Methods*: The selection of samples of Bengkirai (Shorea laevis) logs in this study was carried out using the Purposive Sampling method (intentional sampling) based on the production process that ran during the study (primary data collection).*
Results*: The results of this study show the general yield of IPHHK CV. Mustika Sari is 75.26%. Based on diameter class, the highest yield was found in the 50-59 cm diameter class, which was 74.15%, while the lowest was found in the 80 cm diameter class, which was 71.68%. Based on the quality of raw materials, the highest yield is in the F (First) quality of 73.32% while the S (Second) quality yield is 70.42%*
Conclusion:*Round wood raw material in IPHHK CV. Mustika Sari contains defects that reduce the volume of logs and affect the yield value where there are only two types of defects, namely tunnel and broken/split.*
Key Word*:**Shorea Laevis Ridl, Yield Test, CV. Mustika Sari***

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I. Introduction

Shorea laevis (Ridl.) is a type of tree from the Dipterocarp tribe in Indonesia and is known by the trade name Bangkirai [1]The Sundaland biogeographic region of South-East Asia, which consists of the Malay Peninsula, the big islands of Sumatra, Java, and Borneo, as well as the smaller islands around them, is noted for its great plant species diversity. The Southeast Sundaland biogeographic region is particularly abundant in rainforests. Shorea laevis Ridl. known as a wood-producing tree. Its leaves are also used for medicine. However, it was later discovered that Shorea laevis has a by-product in the form of using its leaves as a medicinal plant.[2]

Continental wood (Shorea laevis Ridl) in general is still rarely studied in terms of its general properties of the wood. Knowledge of the general properties of wood will provide basic information in the development of the use of the wood for carpentry In Southeast Asia, tropical rainforests have been influenced by climatic variations during past glacial epochs. Examine how changes in land areas and temperature have altered the genetic features of the region's rainforest trees.[3]

The method of measuring logs in force in Indonesia is determined based on the Decree of the Director General of Forestry Production Development with Decree number SK.68/VI-BPPHH/2004 dated June 18, 2004. The measurement system used is the metric system, namely meters, centimeters, and so on. The measuring instruments used are scale sticks and measuring tapes, which must be periodically calibrated by the authorized agency.In the world of trade, S. parvifolia wood can be used as raw material for veneer, plywood, bulkhead boards, household furniture, frames, decorative wood and molding.

Plantation forest development with High productivity is expected from this type. The supply of quality seeds of S. parvifolia on an ongoing basis is necessary to support the development of high-productivity plantations[4].The development of product diversification of S. laevis leaves for medicine certainly requires adequate raw materials, both in terms of quantity and quality. So far, the people of Dusun Nyapa take Irai leaves directly from the forest [1]

Tropical rainforests in Southeast Asia have been affected by climatic fluctuations dur- ing past glacial eras. to examine how the accompanying changes in land areas and temperatures have affected the genetic

properties of rainforest trees in the region. Technological advances in the wood processing industry are not only marked by the development or variation of production results but are also marked by increased efficiency, especially an increase in the volume of production that can be produced from raw materials in each production process. A yield is the number of finished goods that can be produced from the raw materials used in each manufacturing process.

Therefore, this study was intended to examine the yield of sawn logs and the effect of wood defects on the yield value.

II. Material And Methods

The average annual rainfall taken from the climatological station in this area is 2355, 58 mm per year, the maximum air temperature during the day reaches 32.77^0 C and the maximum temperature is 29.10^0 C at night 24, 26^0 C and minimum 23.26^0 C

Research Location : The location of this research was carried out in IPHHK CV. Mustika Sari is located in Kenyanyan Village, Siluq Ngurai District, West Kutai Regency, East Kalimantan.

Study Duration: 60 days (February 2021 – April 2022)
Penelitian ini dilaksanakan selama 60 hari (Mei 2008 – Juni 2008) yang terdiri dari :
Study Design: Literature Study, Field Orientation, Research Preparation, Data Collection, Data Processing and Analysis
Research Materials and Tools : The research materials and tools used include the following:

1. Crayon or chalk to mark the selected logs as sample samples.
2. Scale Stick to measure the length of logs as well as the length, width and thickness of sawn timber.
3. Tally sheets and writing utensils to record measurement results.
4. Calculator to calculate and process data.
5. Cameras for research documentation.
6. Phiband to measure the diameter of logs.
7. Meters.

Research Object
The focus of this study is the Bengkirai logs found in IPHHK CV. Mustika Sari, along with the parameters that have been observed.
1. wood diameter and length
2. faulty wood
3. The wood's quality.

Sampling techniqueSampling technique
1. Number of Samples
The number of samples in this study was 20 samples of logs. The logs selected as samples are planned to represent 4 diameter classes, where each diameter class consists of 5 samples. The 4 diameter classes are:

a) 50-59 cm diameter class
b) 60-69 cm diameter class
c) 70-79 cm Diameter range
d) 80 cm UP Diameter Class

2. Sample Selection
The selection of samples of Bengkirai (Shorea laevis) logs in this study was carried out using the Purposive Sampling method (intentional sampling) based on the production process that ran during the study (primary data collection).

Data Collection and Processing

1. Data Collection
   The types of data collected in this study consisted of primary and secondary data.
   a) Primary information
      This study's primary data set includes:
      • High-quality logs
      • Log length and diameter
      • Length, width, and thickness of sawn timber.
      • The number of sportsmen of each raw material.

b) Secondary Information
Secondary data collected to complement the results of this study includes:
• Basic company information
• Source of ingredients
• Sawn timber marketing

2. Data Processing

a. Diameter measurement

Diameter measurements were carried out on both bontos, the shortest diameter through the centre of the bounty was measured first, and then the longest diameter through the center of the bounty. The results of these measurements are processed using the formula:

$$\mathbf{D} = \frac{\frac{1}{2}(d_1 + d_2) + \frac{1}{2}(d_3 + d_4)}{2}$$

where :

d1 = The shortest diameter through the centre of the bontos at the base of the bontos.
d2 = The longest diameter through the centre of the bontos at the bontos' base.
d3 = The shortest diameter through the centre of the bontos at the end of the bontos.
d4 = The longest diameter through the centre of the bounty at the end of the bontos

b. Length measurement

Determine the shortest distance between the two bontos parallel to the axis of the wood with a full multiple of 10 cm and a splice of 10 cm

c. Log Volume

The determination of the content (volume) of jungle logs with the determination of the content (volume) of jungle logs is carried out based on the length and diameter obtained from the measurement results, then searched for in the table of contents of jungle logs. The Brereton Metric formula is used to get the table of contents for logs, which is:

$$V = \frac{\frac{1}{4}\,\pi . D^2 . L}{10.000}$$

where :

V	=	Volume/Fill logs (m3)
D	=	Diameter of log (cm)
L	=	Length of log (m)
1/4 π	=	1/4 . 3,1416 = 0,7854

d. Volume of Sawn Timber

The volume of sawn timber (sortiment) is calculated using the formula:

$$V = P \times L \times T$$

Where :

V	=	Sorting Volume (m^3)
P =	Sortiment Length (m)	
L	=	Sorting Width (cm)
T	=	Thickness of sortimen (cm)

e. Defect Measurement in Wood

The logs are tested according to the Indonesian Jungle Log Testing Regulations to determine their quality. The defects observed are defects that have a direct relationship to yield, including:

1. Tunnel and rotten heart
The size of the defects in the wood can be known by calculating the distance of each defect to the bounty and then dividing that by the diameter of the bounty.

$$Gr/Bh = \frac{1{,}273\,(\theta\ Hr/Bh/Gr)^2}{D^2}\ x\,100\,\%$$

where :
1,273 = Constant
= Diameter Hr/Bh/Gr
D = Diameter

2. Rotten sapwood
Observation of sapwood suffering from decay, indicated by a clear color change accompanied by softening of the parts.

where : 1,273 = Constant
θ = Diameter Hr/Bh/Gr
D = Diameter

2. Decayed Sapwood
Observation of decaying sapwood, which can be seen by a clear change in colour and a softening of the parts.

$$Gb = \frac{4\ x\ TGb\,(\theta\ KB - TGb)}{\theta\ KB^2}\ x\,100\,\%$$

where:
TGB = Thickness of Rotten Sapwood (cm).
θ KB = Round Wood Diameter (cm)

3. Split and break
The cracks and splits found in the wood were measured in length in each bontos and then added up and comparedwith the length before spoiling.

$$Pe/Be = \frac{Pe/\ Be\ x\,100\,\%}{P'}\,(Shorea\ parvifolia\ DYER.)$$

where :
Pe/Be = Length of split/split
P' = Length before spilation

4. Break the bow and the bracelet.
How big the crack in the wood can be known by calculating the distance of each break in the bontos following the direction of the growing circle and its shape is < 1/2 circle (broken arc) and > 1/2 circle or full in the form of a full circle (broken bracelet).

$$\%\ Pb/\ Pg = \frac{Pb/\ Pg\ terbesar}{\theta\ bontos\ Ybs}\ x\,100\%$$

where :
Pb = Broken Bontos
Pg = Broken Bracelet

5. Cylindrical
Cylindricity can be determined by comparing the diameter of the tip with the diameter of the base on each bontos. After knowing the results of the comparison, the percentage is then determined.

$$\frac{D_1}{D_2} x 100\%$$

where :
D1 = shortest (bontos tip/base) diameter (cm)
D2 = Longest (bontos tip/base) diameter (cm)
Bontos results at length and base, results are averaged when 90% = Cylindrical (Si), 80–90% = Almost Cylindrical (Hsi), < 80% = Not Cylindrical (Tsi)

f. Sawmill Yield
After the volume of logs and the volume of sorting are known, the yield of sawmills can be calculated using the formula:

$$R = \frac{\text{Output}}{\text{Input}} X \quad 100\ \%$$

Where
R = the Sawmill Yield (%).
Input = log volume (m^3)
Output = Volume sortimen (m^3)

III. Result

The research was conducted by measuring and testing based on the type and quality of raw materials in the Wood Forest Products Primary Industry, CV. Mustika Sari in Kenyanyan Village, Siluq District, West Kutai Regency, East Kalimantan Province, produced the following yield values:

1. The yield of sawmills of Bangkirai (Shorea laevis) species in general.
2. Sawmill yield of Bangkirai (Shorea laevis) species based on diameter class
3. Sawmill yield of F (First) quality round wood
4. Sawmill quality S yield (Second).

Based on the yield value obtained from the research carried out by measuring and testing based on the type of wood and wood quality, it can be grouped as follows:

1. The overall yield was obtained by comparing sawn timber and Bangkirai logs (Shorea laevis) as a whole.
2. Yield by type of Bangkirai (Shorea laevis) based on diameter class, obtained by comparing sawn wood andlogs from each type of wood.
3. Yield based on quality is obtained by comparing sawn wood and logs from each quality of raw material.

To find out more clearly the yield value obtained and the explanation, it can be seen as follows, namely:

A. Total Yield

The yield obtained by comparing the volume of sawn wood with the volume of logs as a whole can be seen in Table 1. as follows:

Table 1. The yield was obtained by comparing the volume of sawn timber with the overall volume of logs in IPHHK CV. Mustika Sari.

Type	Volume of Logs (m3)	Sawn Timber Volume (m3)	Yield (%)
Bangkirai	33,85	25,36	74,92

From Table 1. above, it can be seen that IPHHK CV. Mustika Sari produces a general yield value of 74.92%, which is obtained by comparing the total volume of sawn wood of 25.36 m^3 with the total volume of round wood of 33.85 $m^{3.}$

B. Yield Diameter Classification

From the results of the study, the yield based on the type of wood by comparing the volume of sawn wood with the volume of logs from each type of wood studied can be seen in Table 2.

Table 2. The yield obtained by comparing the volume of sawn timber with the volume of meranti red logs (Shorea sp)

Type	Class Diameter(cm)	Volume of Logs (m3)	Sawn Timber Volume (m3)	Yield (%)
Shorea sp	50 – 59	4,66	3,65	78,32
Shorea sp	60 – 69	6,94	5,23	75,36
Shorea sp	70 – 79	9,30	6,78	72,90
Shorea sp	80 Up	12,95	9,39	72,51
Shorea sp	50 – 59	4,66	3,65	78,32

From Table 2. above, it can be seen that based on wood diameter class, IPHHK CV. Mustika Sari produces the highest yield value in the diameter class 50 - 59 of 78.32% which is obtained by comparing the volume of sawn wood of 3.65 m^3 with the volume of round wood of 4.66 m^3. Then the yield value decreased in the diameter class 60 – 69 with a yield value of 75.36% which was obtained by comparing the volume value of sawn wood of 5.23 m^3 with the volume of logs of 6.94 m3. While the lowest yield value is in the 80 cm diameter class, which is 72.51%, obtained by comparing the volume value of sawn wood of 9.39 m^3 with a volume of 12.95 m3 of logs.

IV. Discussion

General Yield.

From the results of research conducted at IPHHK CV. Mustika Sari turned out to be a general yield of IPHHK CV. Mustika Sari is 72.56%. This happens because the quality of the available raw materials is quite good, the workforce is quite skilled, and the sortimens produced are dominated by large sizes, while small sorties are produced only to meet local needs.

Things that affect the yield include wood quality, wood size, type of saw, size, and type of sorting produced, sawing method, labor, materials, equipment, layout, and log defects. This is in accordance with the opinion expressed by[5][6], which stated the factors that influenced the yield, among others: wood quality, wood size, type of saw, size, and type of sorting produced, sawing method, and according to [7]that wood processing work must be arranged in a sequence of workers arranged in such a way as to achieve high efficiency in the use of materials, labor and equipment. To get this, the spatial layout in the factory must be planned as well as possible, which, according to [5][8]must pay attention to the following factors: the capacity of each machine, the size of the wood; the space for workers to move; the shape and composition of the resulting sportsmen.

Besides this, there are also differences in sawing technical problems, as stated by [8]who stated that horizontal frame saws are not suitable for making high-quality sawn wood, because the shape of the carriage makes that impossible. Meanwhile, if the sawmill mainly uses a band saw, it is possible to make high-quality sawn wood. These differences, of course, bring differences in the amount and quality of sawn timber produced.

The Yield by Diameter Class

Based on diameter class, the yield value in IPHHK CV. Mustika Sari sequentially from the highest yield yields are as follows: diameter class 50-59 cm is 74.15%, 60-69 cm with a yield value of 72.81%, 70-79 cm is 72 80% and the lowest is in the cm Up diameter class, which is 71.68%, for more details can be seen in Figure 1 below:

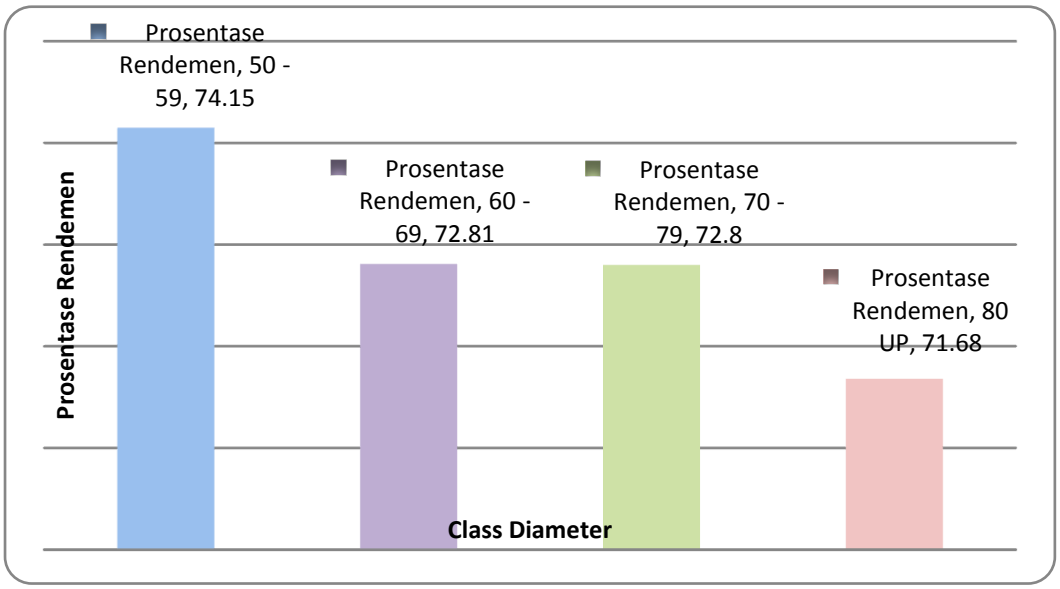

Figure 1. Percentage of Yield by Diameter Class in IPHHK CV. Mustika Sari.

Judging from the yield percentage above, the difference in yield value in each diameter class is more influenced by the size of the sawn wood sortiment produced by each wood diameter class. This happens in line with market demand for the size or assortment of sawn timber for each type. The diameter class 50–59 cm resulted in the highest yield value compared to the other three diameter classes because the sawn wood was produced in the form of beams and bearings in a relatively large size and did not produce plank sorting. While the 80 cm in diameter class tends to be focused on meeting the needs of the board, only a small part is used as a beam. The empirical experience of workers in the sawmill industry states that logs will get maximum results when processed into beam sorting such as rafters or bearings, and vice versa, they will produce lower yields when processed into boards.

This is in accordance with the opinion expressed by [8]which states that the factors that affect the yield include the quality of the nutrient wood, the size of the nutrient wood, the type of saw, the size and type of sorting produced, and the method of sawing.

Yield Based on Quality

According to the findings of research conducted at IPHHK CV. Mustika Sari, the yield value of quality F (First) is 73.32% and quality S (Second) is 70.42%. Figure 2 shows the yield value based on quality in greater detail:

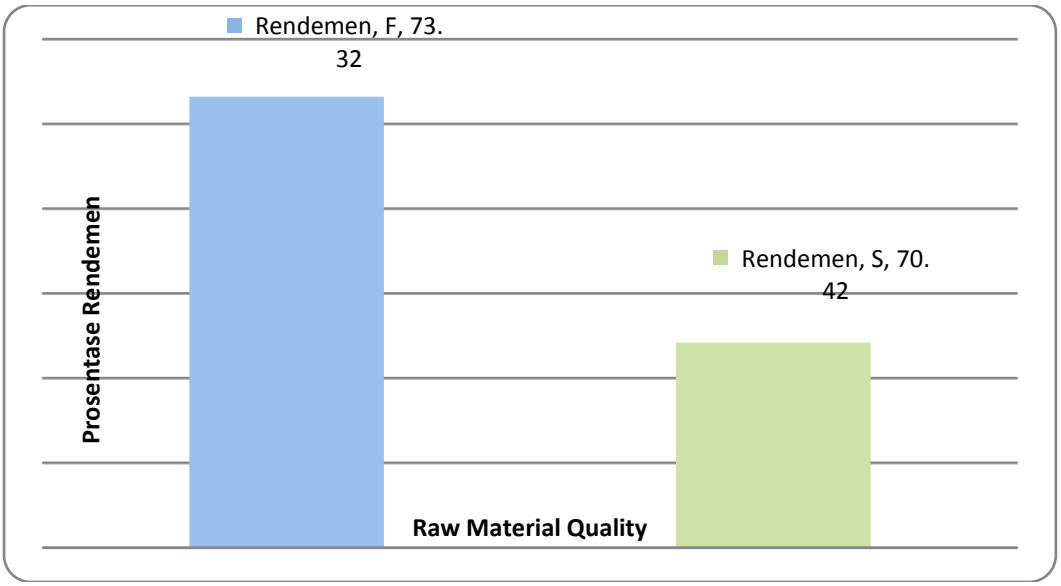

Figure 2: Yield Percentage Based on Raw Material Quality in IPHHK CV. Mustika Sari.

Based on the description above, it can be clearly seen that the quality of raw materials has a major role in influencing the yield value. This means that in F (First) quality logs, the number of parts wasted or sawmill waste consisting of Tibetan, wood parts that contain defects, trimming residue, and powder is less than in S (Second) quality logs, even though they have a very small difference in the percentage yield value.

In relation to the quality, which is affected by the presence of defects, it is clear that the effect of defects on the yield value is clear. This is because the defects in the logs will automatically reduce the productive area of the wood to get processed products in the form of sawn wood. This is in accordance with the opinion of [9]that a wood defect is any abnormality found in the wood. This abnormality can affect the quality and or the results obtained from the wood.

In some extreme cases, even the presence of defects in logs such as rotten sapwood and sapwood as well as defects that trigger rotting of logs such as cracks/splits, broken bows/bracelets, and medium-to-large boreholes can cause the logs to no longer be used.

Defects that Reduce Yield

On the raw material of logs in IPHHK CV. Mustika Sari has defects that reduce the volume of logs and affect the yield value, wherein the diameter class 50-59 cm there are 2 stems / rotten liver defects (average 9.88%), diameter class 60-69 cm there are 2 stems (average 13.21 %), 2 stems broken/split defects (28.66 % on average) and in the 70-79 cm diameter class there is 1 tunnel defect (3 ,58%) and in the diameter class cm UP there is a tunnel defect of 1 rod (9,43%).

Based on observations of tunnel defects and splitting, it has the potential to reduce the yield value because the location of the defects is in a productive area.

V. Conclusion

Based on the results of research on the Timber Forest Products Primary Industry (IPHHK) CV. Mustika Sari can be concluded as follows:

1. The overall yield for IPHHK CV. Mustika Sari was 72.56%.This happens because the quality of the available raw materials is quite good, the workforce is quite skilled, and the sortimen produced are dominated by large sizes, while small sorties are produced only to meet local needs.
2. Based on the diameter class, the highest yield was found in the diameter class 50 – 59 cm, this was due to the sortimen produced in the form of blocks compared to the 80 cm UP diameter class, which resulted in the sortimen in the form of boards.

3. Based on the quality of raw materials, the yield of quality F (First) has the highest value, which is 73.32% compared to quality S (Second), with a yield value of 70.42%
4. Round wood raw material in IPHHK CV. Mustika Sari contains defects that reduce the volume of logs and affect the yield value where there are only two types of defects, namely tunnel and broken/split.

Suggestions

1. In choosing the logs to be used for sawing raw materials, in addition to paying attention to the type of wood, quality, and size of the wood, also pay attention to the type and number of defects that exist in the wood. As much as possible, avoid defects such as chimneys, cracks, and large boreholes, especially old logs. Because these defects can stimulate wood decay, which results in low yields from sawmills.
2. Considering the increasingly limited availability of raw materials and in order to optimize the utilisation of raw materials and to support local needs, it is necessary to process sawn wood to the smallest size.

References

[1] R. Handayani dan Hartati Apriani, R. Handayani, dan Hartati Apriani, P. Balai Besar Penelitian, and P. Ekosistem Hutan Dipterokarpa, "Pengaruh Pupuk Npk Dan Media Tanam Terhadap Pertumbuhan … Pengaruh Pupuk Npk Dan Media Tanam Terhadap Pertumbuhan Dan Produktivitas Daun Pada Bibit Shorea Laevis Ridl. The Effect of NPK Fertilizer and Planting Media on The Growth and Production of Shorea ," *J. Penelit. Ekosist. Dipterokarpa*, vol. 6, no. 2, pp. 107–116, 2020, [Online]. Available: http://doi.org/10.20886/jped.2020.6.2.107-116

[2] R. H. H. Apriani, "Pengaruh Pupuk NPK Dan Media Tanam Terhadap Pertumbuhan Dan Produktivitas Daun Pada Bibit Shorea laevis Ridl.," *J. Penelit. Ekosist. Dipterokarpa*, no. Vol 6, No 2 (2020): Jurnal Penelitian Ekosistem Dipterokarpa, pp. 107–116, 2020, [Online]. Available: https://ejournal.forda-mof.org/ejournal-litbang/index.php/JPED/article/view/6235/5304

[3] M. Ohtani *et al.*, "Nuclear and chloroplast DNA phylogeography reveals Pleistocene divergence and subsequent secondary contact of two genetic lineages of the tropical rainforest tree species Shorea leprosula (Dipterocarpaceae) in South-East Asia," *Mol. Ecol.*, vol. 22, no. 8, pp. 2264–2279, 2013, doi: 10.1111/mec.12243.

[4] P. Biology, E. Conference, and D. Kepong, "Keragaman Pertumbuhan Bibit Meranti Sarang Punai (Shorea parvifolia dyer .) Populasi Muara Wahau , Kalimantan Timur Seedling Growth Variation of Shorea parvifolia from Muara Wahau Population in East Kalimantan," vol. 14, pp. 93–98, 2017.

[5] O. Rachman, W. Sidan, and S. Surjokusumo, "Pengaruh pola penggergajian terhadap-ren." Jurnal Penelitian Hasil Hutan, forest products Research Journal, pp. 249-258 Vol 5 No 5, 1988. [Online]. Available: https://media.neliti.com/media/publications/179590-ID-pengaruh-pola-penggergajian-terhadap-ren.pdf

[6] Sopianoor, Z. Yahya, and M. P. Biantary, "Studi Rendemen Bahan Baku Log Pada Iu-Iphhk Rusmandiansnyah Di Kecamatan Damai Kabupaten Kutai Barat," *AGRIFOR Vol. XV Nomor 2, Oktober 2016*, vol. 12, no. 31, pp. 99–107, 2011, [Online]. Available: http://ejurnal.untag-smd.ac.id/index.php/AG/article/view/2084/2099%0Ahttp://ejurnal.untag-smd.ac.id/index.php/AG/article/view/2084%0Afile:///D:/data D/Kuliah/SEM9/KP/Penelitian Scrap/53300-ID-studi-rendemen-bahan-baku-log-pada-iu-ip.pdf%0Ahttp://ejurnal.u

[7] S. Suriarahardja Pasaribu, Ridwan A.,, Siagian, Rena,, *Masalah bahan baku untuk industri kertas di Jawa Barat = Problems of raw material supply for paper manufacture in West Java*. Bogor: Lembaga Penelitian Hasil Hutan, Direktorat Jenderal Kehutanan, Departemen Pertanian, 1974.

[8] F. G. Becker *et al.*, "No 主観的健康感を中心とした在宅高齢者における健康関連指標に関する共分散構造分析Title," *Syria Stud.*, vol. 7, no. 1, pp. 37–72, 2015, [Online]. Available: https://www.researchgate.net/publication/269107473_What_is_governance/link/548173090cf22525dcb61443/download%0Ahttp://www.econ.upf.edu/~reynal/Civil wars_12December2010.pdf%0Ahttps://think-asia.org/handle/11540/8282%0Ahttps://www.jstor.org/stable/41857625

[9] R. Maharani and A. Fernandes, "Consumer acceptance on product diversification of Bengkirai (Shorea laevis): Attitudes, expectations and perception," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 935, no. 1, 2020, doi: 10.1088/1757-899X/935/1/012017.

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