



Report of the Workshop on the Dissemination of the Development of the DNA Database and the Molecular Genetic Study for *Dalbergia latifolia* Populations in Java and West Nusa Tenggara, Indonesia



Jakarta, Indonesia
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Report of the Workshop on the Dissemination of the Development of the DNA Database and the Molecular Genetic Study for *Dalbergia latifolia* Populations in Java and West Nusa Tenggara, Indonesia

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We are grateful to Mrs Indra Exploitasia, Director of Biodiversity Conservation of Species and Genetics, Ministry of Environment and Forestry, and her staff, Dr Kirsfianti L. Ginoga, former Director of Forest Research and Development Center, which is currently the Center for Standardization of Sustainable Forest Management Instruments, Dr Atit Kanti, former Head of Research Center for Biology, Dr Anang Setiawan, Head of Research Center for Ecology and Ethnobiology, and Dr Bayu Adjie, Head of Research Center for Biosystematics and Evolution, National Research and Innovation Agency for their support and assistance in this project.

High appreciation is extended to all participants, speakers, and presenters, as well as resource persons who have been sharing their knowledge, experiences, and significant inputs in the workshop and the preparation of this report.

On behalf of the project team,

Dr. Kusumadewi Sri Yulita
Project Team Leader

ACRONYMS AND ABBREVIATIONS

BRIN	National Research and Innovation Agency (<i>Badan Riset dan Inovasi Nasional</i>)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CTSP	CITES Tree Species Programme
DNA	Deoxyribonucleic Acid
IPB	Bogor Agriculture University
KKHSG	Biodiversity Conservation of Species and Genetics (<i>Konservasi Keanekaragaman Hayati Spesies dan Genetik</i>)
MOEF	Ministry of Environment and Forestry
NDF	Non-detriment Findings
RFID	Radio-Frequency Identification
QR	Quick Response

EXECUTIVE SUMMARY

A workshop on disseminating the development of the DNA database and molecular genetic study for *Dalbergia latifolia* populations in Java and West Nusa Tenggara was held on 31 May 2022. To reach a wider audience, the workshop was conducted in a hybrid format, both offline and online, from The Salak Heritage Hotel in Bogor, Indonesia, with a zoom meeting platform. The workshop was designed to disseminate the DNA database application of *Dalbergia latifolia* from Java and West Nusa Tenggara and to obtain inputs from related institutions to improve the database. A total of 58 participants from government institutions, research institutes, universities, and the private sector attended the workshop and actively provided feedback and input.

This workshop focused on discussing the *Dalbergia latifolia* DNA database, and the recommendations agreed upon at the workshop included the following:

- (i) Coordination between MOEF and BRIN is needed to decide on the server that will be used to store the database data.
- (ii) Web developers must provide all documentation of the stages in preparing a developed database application to facilitate further development without obstacles in updating data.
- (iii) This database will become a public domain with limited data that can be accessed, and all the data will be stored and become the joint property of MOEF and BRIN.
- (iv) Chain-of-custody techniques and DNA databases that have been developed would be used as reference data for the identification of DNA population fingerprints at the provincial and district levels, and the final haplotype map will continue to be developed. Specific data for each district and province in Java and West Nusa Tenggara is expected to be obtained.

1. Background

Dalbergia latifolia (rosewood) is one of Indonesia's highly valuable commercial wood species categorized as a fancy wood. Most of this species is found in Java and West Nusa Tenggara, although it can also be found outside the two islands. However, there is not much information about its natural distribution in nature or information about its trade at the domestic level.

Since January 2017, rosewood has been listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II, which means that this species is considered endangered if the trade in this species continues without proper rules and regulations. Consequently, there must be adjustments made to the national laws and supporting documents for domestic and foreign trade, which should accommodate CITES trading instruments. This regulation applies to trade in all forms/types of rosewood specimens, both in the form of logs, sawn timber, and finished products.

To ensure the sustainable management of rosewood, the Directorate of Biodiversity Conservation of Species and Genetics, Ministry of Environment and Forestry; the Research Organization for Life Sciences and Environment; the National Research and Innovation Agency; and the Center for Standardization of Sustainable Forest Management Instruments, Ministry of Environment and Forestry; through the CITES Tree Species Programme (CTSP) conducted a study on the potential and distribution as well as the sustainability and use of rosewood species. Comprehensive analysis of the genetic diversity of rosewood is essential in the sustainable management of rosewood. Therefore, molecular studies and the development of DNA isolation from rosewood products and molecular markers were carried out for the chain of custody and identification of rosewood from Indonesia. Together with the preparation of the Non-detriment findings (NDF) report, a collection of leaves, barks, and finished products had been collected from various regions in Java and West Nusa Tenggara since September 2020. The DNA analysis was carried out at the molecular laboratory of the National Research and Innovation Agency in Cibinong, Indonesia. The results were compiled and stored in a DNA database together with a genetic haplotype map of *Dalbergia latifolia* in Java and West Nusa Tenggara, Indonesia.

Various activities to develop the DNA database had been carried out, among others, were the following:

- (i) Collected leaves, barks and wood samples from the identified population.
- (ii) Conducted DNA extraction, purification and amplification of PCR and DNA sequencing.
- (iii) Developed a DNA extraction protocol for *Dalbergia latifolia*.
- (iv) Generated a genetic haplotype map of *Dalbergia latifolia*.

The Project Team had developed a DNA database application from various samples of rosewood leaves and finished products collected from several locations in Java and West Nusa Tenggara. A one-day workshop was carried out to disseminate the DNA database by inviting various relevant stakeholders.

2. Objectives

The objectives of the workshop were as follows:

- (i) To disseminate the development of the DNA database and the molecular genetic study for *D.latifolia* from Java and West Nusa Tenggara.
- (ii) To obtain inputs from related institutions to improve the DNA database of *Dalbergia latifolia* in Java and West Nusa Tenggara, Indonesia.

3. Venue, Time and Program

The workshop was held on 31 May 2022 at The Salak Heritage Hotel in Bogor, Indonesia, with a zoom meeting platform. To reach a wider audience, the workshop was conducted in a hybrid format, both offline and online. The workshop program is in **Annex 1**.

4. Participants

This workshop was organized by the Directorate of Biodiversity Conservation of Species and Genetics and the National Research and Innovation Agency, Indonesia, with support from the CITES Tree Species Programme (CTSP). The workshop was attended by 58 participants who were representatives from:

- (i) Secretariat of the Directorate Natural Resources and Ecosystem Conservation.
- (ii) Directorate of Biodiversity Conservation of Species and Genetics.
- (iii) Directorate of Forest Product Processing and Marketing.
- (iv) Research Center for Ecology and Ethnobiology.
- (v) Research Center for Biosystematics and Evolution.
- (vi) Center for Standardization of Sustainable Forest Management Instruments.
- (vii) International Cooperation Bureau.
- (viii) Secretariat of the Scientific Authority for Biodiversity.
- (ix) Conservation of Natural Resources Regional Office University.
- (x) Private sector.

A complete list of the participants is in **Annex 2**

5. Summary of the workshop

5.1. Welcome remarks at the opening session

The workshop was officially opened by Mr Agung Nugroho, Head of Species and Genetic Utilization Division, on behalf of the Director of Biodiversity Conservation of Species and Genetics. He expressed his appreciation to the members of the Project Team, who had compiled the *Dalbergia latifolia* NDF and the success in conducting the *Dalbergia latifolia* NDF workshop the previous day. He emphasized the importance of the outputs of this project implemented jointly between the Directorate of KKHSG, BRIN and the IPB University to

develop the NDF documents and DNA database to determine conservation and trade measures which are the mandate of CITES.

The NDF report is very important as a reference for formulating trade regulations and protection of the *Dalbergia latifolia* species. Meanwhile, the DNA database is crucial as a data bank for chain of custody analysis and policy-making based on scientific recommendations.

Dr Amir Hamidy from the Research Center for Biosystematics and Evolution, BRIN led the workshop, which focused on discussing the *Dalbergia latifolia* DNA database. As an introduction, he explained that this DNA database is a reference for scientific analysis and decision/policy making which is very much needed by Indonesia under CITES, and in the circulation/distribution and trade in the timber species. The presentation was started by Dr Yulita from BRIN, presenting the development of the DNA database and the study of the molecular genetics for *Dalbergia latifolia* in Java and West Nusa Tenggara.

5.2. Development of the DNA Database and the Study of the Molecular Genetics for *Dalbergia latifolia* in Java and West Nusa Tenggara

Dr Yulita emphasized that *Dalbergia latifolia* has become one of the pillars of community income that should be followed by appropriate policies and analysis for the continuity of its distribution and trade, as well as the protection of the species and its habitats in a sustainable way. This developed database can be referred to as an analytical forum where the analyzed results can be used in decision-making to provide justice for all parties involved in the management, conservation and utilization of the species. All the studies conducted were to ensure the sustainability of *Dalbergia latifolia* in Indonesia.

She described several methods used for a chain of custody, including punching (stamp), painting, barcodes, and QR Codes, but these methods have some weaknesses in tracing. The methodology that is quite reliable in tracing is RFID (Radio-Frequency Identification), isotopic fingerprinting, and DNA fingerprinting. DNA fingerprinting was the method used by the project. This method requires precision and accuracy in sampling and is integrated with spatial data. The purpose of developing a DNA database is for traceability based on DNA data by identifying single nucleotide variations in 5 non-coding regions in the chloroplast genome as geographic identity and identifying types of genetic variants (haplotypes) in Java and West Nusa Tenggara. The origin of the wood and its genetic type can be determined from various specimens through the DNA data reference that has been developed.

The project had undertaken a study of the molecular DNA and conducted DNA isolation to obtain data on the genetic diversity of *Dalbergia latifolia*. The results showed that West Java had three variants; Central Java had one variant; East Java had two variants; and West Nusa Tenggara had also two variants (Bima City had one particular variant and Sumbawa and Dompu District had the other variant). The DNA analysis was integrated with the spatial data taken during sample collection to generate a genetic haplotype map (**Figure 1.**). All the data

collected during the project implementation were stored in the DNA database system which had been developed. Her presentation is in **Annex 3**.

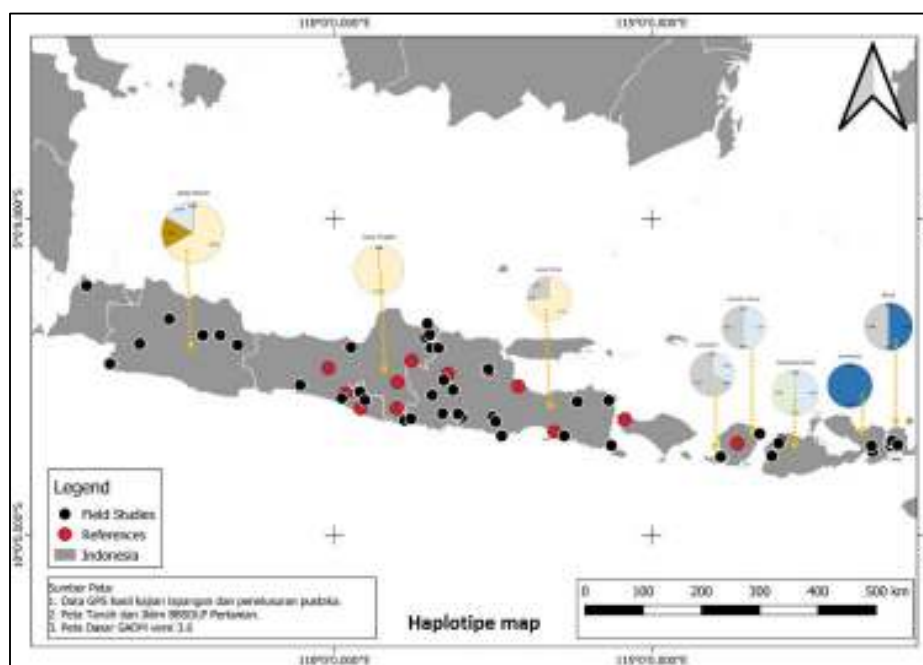


Figure 1. Sample of Genetic Haplotype Map

5.3. DNA Isolation Steps for *Dalbergia latifolia*

The steps involved in DNA isolation for *D. latifolia* commenced with the collection of genetic materials (leaves, wood and finished products) from several visited sites. This was followed by the molecular work conducted at the Molecular Systematics Laboratory of the National Research and Innovation Agency, Indonesia. She explained how the sample for DNA analysis would record the DNA variations from the collected samples at each site. This method was carried out to produce DNA records in each specimen which could be visualized as DNA sequences.

Before the DNA isolation was carried out, the wood sample must be cleaned first. The outer tissue of the wood had to be removed, while 20 mg of the inner tissue was taken to be used as a sample for DNA isolation. The wood samples (20 mg of lyophilized tissue) were ground using a mortar and pestle. The extraction buffer was mixed into several parts. The samples were vortexed and incubated in a water bath. The tube was inverted 2-3 times during incubation. The buffer was added to the sample and mixed thoroughly using a centrifuge. The DNA was then separated from the solution using a centrifuge. After obtaining the DNA from the sample, the genomic DNA was visualized through gel electrophoresis and documented using a gel documentation system.

After the extraction and visualization steps, amplification of the DNA followed as well as continued with the visualized DNA sequences (DNA sequencing). All the steps involved in the DNA isolation process are shown in the photographic video in **Annex 4**.

5.4. *Dalbergia latifolia* DNA Database Application

The data collected during the project implementation were integrated into the DNA database system used by the Scientific Authority and the Management Authority. The system contained not only the DNA information of *Dalbergia latifolia* but also the data on ecology that the project had collected. The DNA database system is loaded onto a website, so it must be connected to the internet to access it. The analytical steps used by the DNA database commenced with collecting the data on wood or wood products according to the standard data collection and retrieval procedures, validating the collected data, checking the DNA data from the database, identifying the wood sources, and advocating regulations, as shown in **Figure 2**. This DNA database has been developed not only for scientific studies, but it is hoped that it could be used to track traded timber and timber products in the future. The data in the database are expected to continue to be updated. Dr Yulita and the web developer explained how the platform was developed, stored primary data, and was frequently used by the Scientific Authority and Management Authority of Indonesia, which is presented in **Annex 5**.

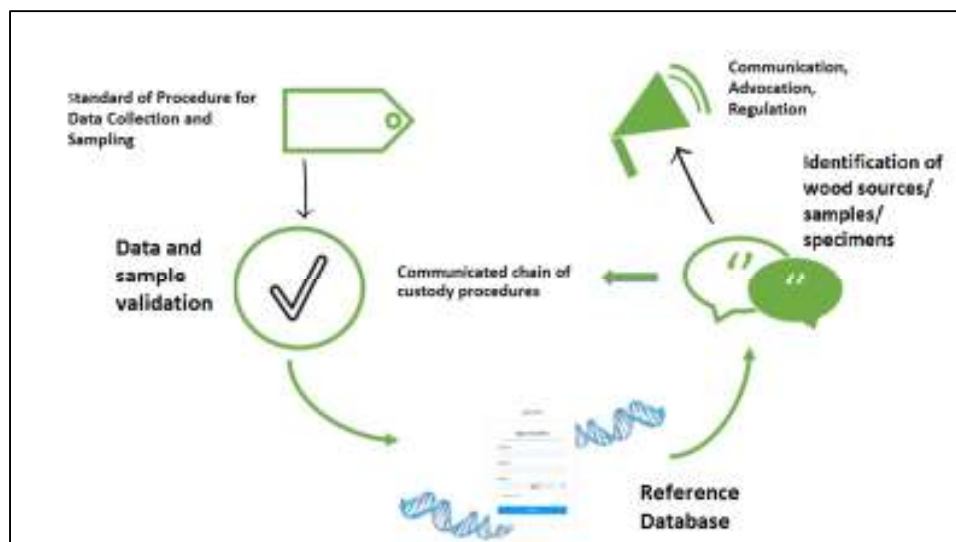


Figure 2. Steps of DNA Database analysis

5.5. Discussion

Several issues were raised during the discussion, among others, were the following:

- (i) The developed DNA database platform is informative and comprehensive, and it is crucial for forensic analysis.
- (ii) The existing data should be integrated and stored on a secure server capable of the parties' (Scientific and Management Authority) access. However, data privacy is also necessary, which requires protection from potential data loss. The database includes activities of preparation, management, safety and storage. The server will be discussed further between BRIN and MOEF.

- (iii) Method of a chain of custody for location has yet to be addressed in the developed DNA database system.
- (iv) The importance of synchronizing data collection from community-owned land.
- (v) Steps to developing a DNA database platform must be clear for future improvements or updates.
- (vi) Tracing DNA will not be the only tool to check the chain of custody because there are also many other choices of methods for tracing the origin of timber.
- (vii) The developed DNA database platform and wood identification method related to implementing regulations in the field for a chain of custody will support law enforcement.

A set of 6 photographs from the workshop is in **Annex 6**.

6. Conclusion and Recommendations

The workshop was designed to disseminate the developed DNA database system for *Dalbergia latifolia* in Java and West Nusa Tenggara. Based on the presentations of the resource person and discussion during the workshop, several findings were agreed upon as follows:

- (i) Currently, the DNA database is not very beneficial but will be helpful for a future chain of custody process.
- (ii) Additional samples are needed to provide more data and to prepare a comprehensive genetic haplotype map.
- (iii) A secure and capable server is indispensable to integrating and storing the collected data.
- (iv) Guidelines for developing the DNA database platform should be compiled to accommodate future improvements or updates.

Recommendations

Several recommendations agreed upon by the participants of the workshop were as follows:

- (i) Coordination between MOEF and BRIN is needed to decide on the server that will be used to store the database data.
- (ii) Web developers must provide all documentation of the stages in preparing a developed database application to facilitate further development without obstacles in updating data.
- (iii) This database will become a public domain with limited data that can be accessed, and all the data will be stored and become the joint property of MOEF and BRIN.
- (iv) Chain-of-custody techniques and DNA databases that have been developed will be used as reference data for the identification of DNA population fingerprints at the provincial and district levels, and the final haplotype map will continue to be developed. Specific data for each district and province in Java and West Nusa Tenggara is expected to be obtained.

Annex 1. Workshop Program

Workshop on the Dissemination of the Development of the DNA Database and the Molecular Genetic Study for *Dalbergia latifolia* Populations in Java and West Nusa Tenggara, Indonesia

Bogor, 31 May 2022

AGENDA

Waktu (WIB)	Agenda	Facilitator/Resource Person
09.00 – 09.30	Registration	Organizing Committee (OC)
09.30 – 09.45	Announcement of the Workshop National anthem (Indonesia Raya) Recite prayer	Ms. Novirin Razanah Jati
09.45 – 09.55	Welcome Remarks	Dr Anang Setiawan, Head of Research Center for Ecology and Ethnobiology National Research and Innovation Agency
09.55 – 10.05	Opening Remarks	Mr Agung Nugroho Head of Species and Genetics Utilization Sub Division, Directorate of Biodiversity Conservation of Species and Genetics, MOEF
10.05 – 10.15	Photo Group	MC
10.15 – 10.30	<i>Coffee Break</i>	Organizing Committee (OC)
10.30 – 11.30	– Development of the DNA Database and the Study of Molecular Genetics for <i>Dalbergia latifolia</i> from Java and West Nusa Tenggara - DNA Isolation Steps for <i>Dalbergia latifolia</i> - <i>Dalbergia latifolia</i> DNA Database Application	– Dr. Kusumadewi Sri Yulita – Web developer
11.30 – 12.30	Discussion	Moderator: Dr Amir Hamidy
12.30 – 13.30	<i>Lunch Break</i>	OC
13.30 – 14.30	Discussion	Moderator: Dr Amir Hamidy
14.30 – 14.45	<i>Coffee Break</i>	
14.45– 15.00	Wrap-up and closing session	Dr Kusumadewi Sri Yulita

Annex 2. List of Participants

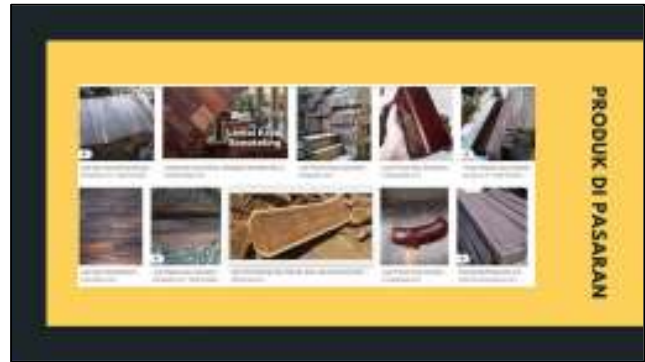
Workshop on the Dissemination of the Development of the DNA Database and the Molecular Genetic Study for *Dalbergia latifolia* Populations in Java and West Nusa Tenggara, Indonesia
Bogor, 31 May 2022

No	Name and Surname	Position	Organization
1.	Aba Kacong	Director	CV Indo Pratama Express
2.	Achmad Faruq Humam	Administration Staff	CV. Adi Guna Utama
3.	Adam Bahtiar	Staff	Directorate of Biodiversity Conservation of Species and Genetics
4.	Agung Nugroho	Chief	Sub Division Utilization Species and Genetics, Directorate of Biodiversity Conservation of Species and Genetics
5.	Agustinus Krisdijantoro	Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – East Nusa Tenggara
6.	Akmad Faizal	Chief	Plant and Nursery Section, Perum Perhutani Divre East Java
7.	Amir Hamidy	Director	Secretariat of the Scientific Authority for Biodiversity
8.	Anang Setiawan Achmadi	Director	Research Center for Ecology and Ethnobiology - BRIN
9.	Atok Subiakto	Expert	Expert
10.	Aris	Staff	Conservation of Natural Resources Regional Office – East Java
11.	Bayu Adjie	Director	Research Center for Biosystematics and Evolution - BRIN
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No	Name and Surname	Position	Organization
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24.	Hari Cahya Putra	Staff	Secretariat Directorate General of Natural Resources and Ecosystem Conservation
25.	Hasnia	Junior Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – East Nusa Tenggara
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29.	Inge Yangesa	Junior Policy Analyst	Directorate of Biodiversity Conservation of Species and Genetics
30.	Irsyad Kamal	Laboratory Assistant	Research Center for Ecology and Ethnobiology – BRIN
31.	Jefta Bilsol Boimau	Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – East Nusa Tenggara
32.	Joko Nugroho	Junior Forest Ecosystem Controller	Directorate of Biodiversity Conservation of Species and Genetics
33.	Kalsum Musa	Chief	West Nusa Tenggara Association Sonokeling Buyers
34.	Khumairoh Nur Azizah	Staff	Directorate of Biodiversity Conservation of Species and Genetics
35.	Kurnia Dewi	Chief	Environment Section, Perum Perhutani divre Central Java
36.	Kusumadewi Sri Yulita	Researcher	Research Center for Ecology and Ethnobiology – BRIN
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38.	Martinus Rhaki	Conservation Analyst	Conservation of Natural Resources Regional Office – East Nusa Tenggara
39.	Melianariskus Banamtuan	Forest Ranger Supervisor	Conservation of Natural Resources Regional Office – East Nusa Tenggara
40.	Meriana Selfiana Mbau	Forest Ranger	Conservation of Natural Resources Regional Office – East Nusa Tenggara

No	Name and Surname	Position	Organization
41.	Muhammad Yarzuqh Zakka	Junior Forest Ecosystem Controller	Center for Standardization of Sustainable Forest Management Instruments
42.	Nawwall Arrofa	Laboratory Assistant	Research Center for Ecology and Ethnobiology – BRIN
43.	Niken Wulandari	Junior Forest Ecosystem Controller	Directorate of Biodiversity Conservation of Species and Genetics
44.	Novirin Razanah Jati	Staff	Directorate of Biodiversity Conservation of Species and Genetics
45.	Oktavianus Alvanaidi Sene	Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – East Nusa Tenggara
46.	Rahmi Nurhidayah	Staff	Directorate of Forest Product Processing and Marketing
47.	Rizki Ari Fambayun	Researcher	Center for Standardization of Sustainable Forest Management Instruments
48.	Sarwo Edy Fiqri	Director	PT Cahaya Ramadhan Sejahtera
49.	Siti Nurjanah	Staff CTSP Programme	Directorate of Biodiversity Conservation of Species and Genetics
50.	Susila	Laboratory Assistant	Research Center for Biosystematics and Evolution– BRIN
51.	Sya'roni Agung Wibisono	Junior Policy Analyst	International Cooperation Bureau
52.	Theodorus Nim TEFA, S.H.	Forest Ranger	Conservation of Natural Resources Regional Office – East Nusa Tenggara
53.	Tika Dewi Atikah	Researcher	Research Center for Ecology and Ethnobiology – BRIN
54.	Titiek Setyawati	Researcher	Research Center for Ecology and Ethnobiology – BRIN
55.	Tri Endang Wahyuni	Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – West Nusa Tenggara
56.	Wajudi	Forest Ecosystem Controller	Conservation of Natural Resources Regional Office – Yogyakarta
57.	Widi Anugrah A	Staff	Directorate of Biodiversity Conservation of Species and Genetics
58.	Wita Wardani	Researcher	Research Center for Biosystematics and Evolution– BRIN

Annex 3. Development of the DNA Database and the Study of the Molecular Genetics for *Dalbergia latifolia* from Java and West Nusa Tenggara



Punching/Brand hammers

- Pros:**
 - Practicality
 - Low cost
 - Low level of information
 - Requires a minimum training level
- Cons:**
 - Not security
 - Low reliability
 - Very easy to make copies of the punches

Chemical Paint Marking

- Pros:**
 - Practicality
 - Low cost
 - Low level of information
 - Requires no training
- Cons:**
 - No readings if paint degrades (can be solved using UVF (Luminescent Nano Particles))
 - Provides information but not log pages

Barcodes

- Pros:**
 - Traceability system is plain
 - Low cost
- Cons:**
 - Difficult to be massively applied in wood trade and wood traceability because of wood texture

QR Codes

- Pros:**
 - Contains information that required for traceability systems
- Cons:**
 - Cannot trace origin



Annex 4. DNA Isolation Steps for *Dalbergia latifolia*



DNA isolation process



Preparing fresh wood samples



Weighing the wood samples



Grinding the sample to a fine powder using a mortar and pestle



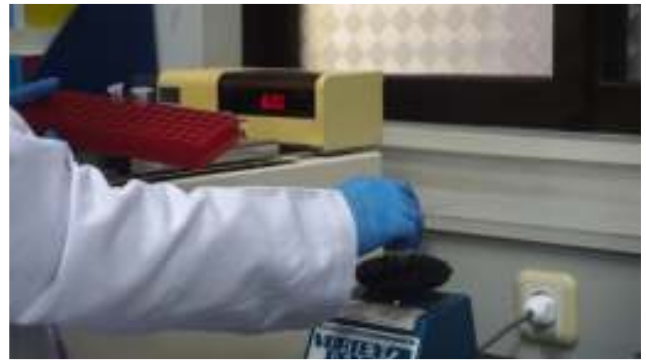
Cleaning the wood powder from the pestle



Transferring the fine powder to a 1.5 ml micro-centrifuge tube



Adding the buffer into the sample tube



Mixing the sample tube by vortex



Incubating the sample



Centrifuging the sample



Moving and adding solution from the microtube into other microtubes



Results of the DNA isolation from gel electrophoresis



Loading dye for DNA extraction



Mixing the DNA isolation with the loaded dye



Visualization of the gel electrophoresis results using the gel documentation system



Photographs of gel electrophoresis from the DNA isolation



Setting up the procedure for DNA amplification

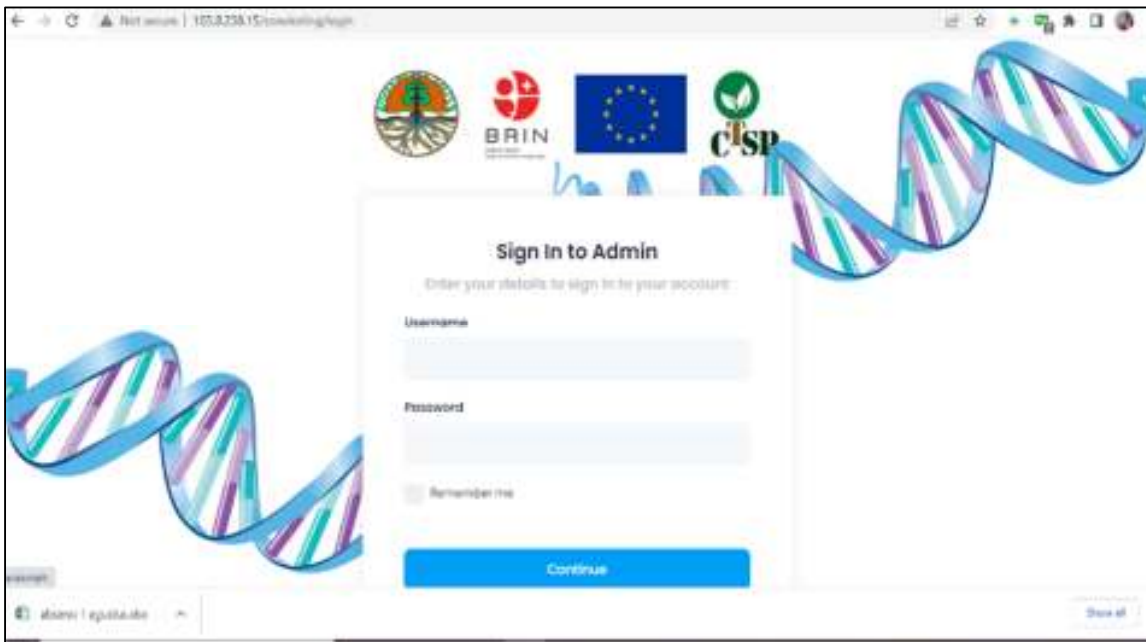


Putting the sample for amplification into a thermal cycler



Results of DNA amplification from gel electrophoresis

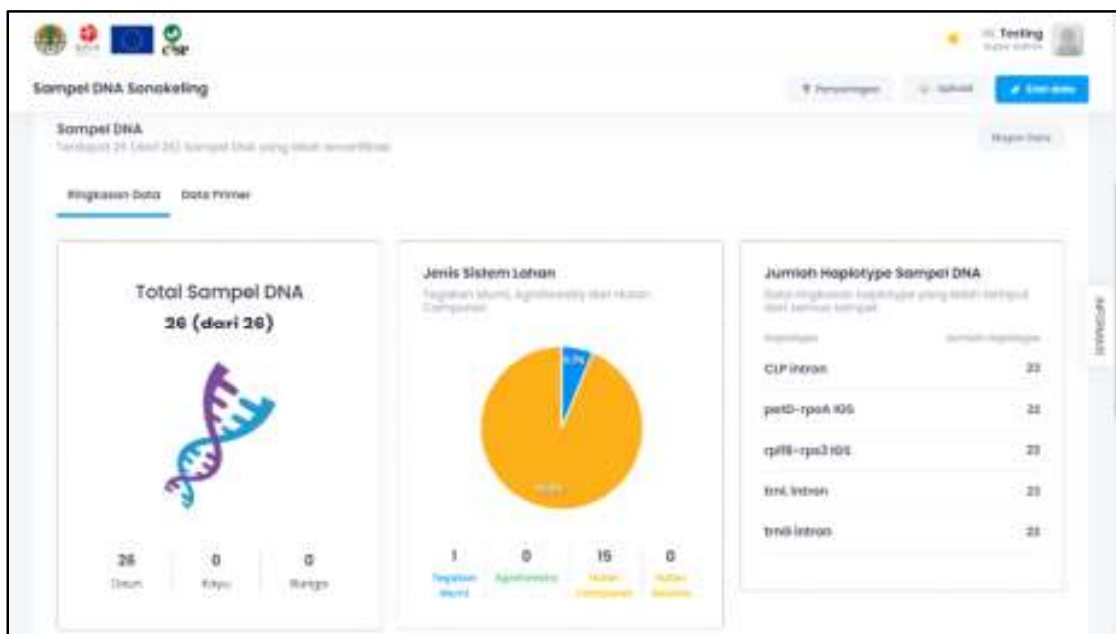
Annex 5. *Dalbergia latifolia* DNA Database Application in Java and West Nusa Tenggara, Indonesia



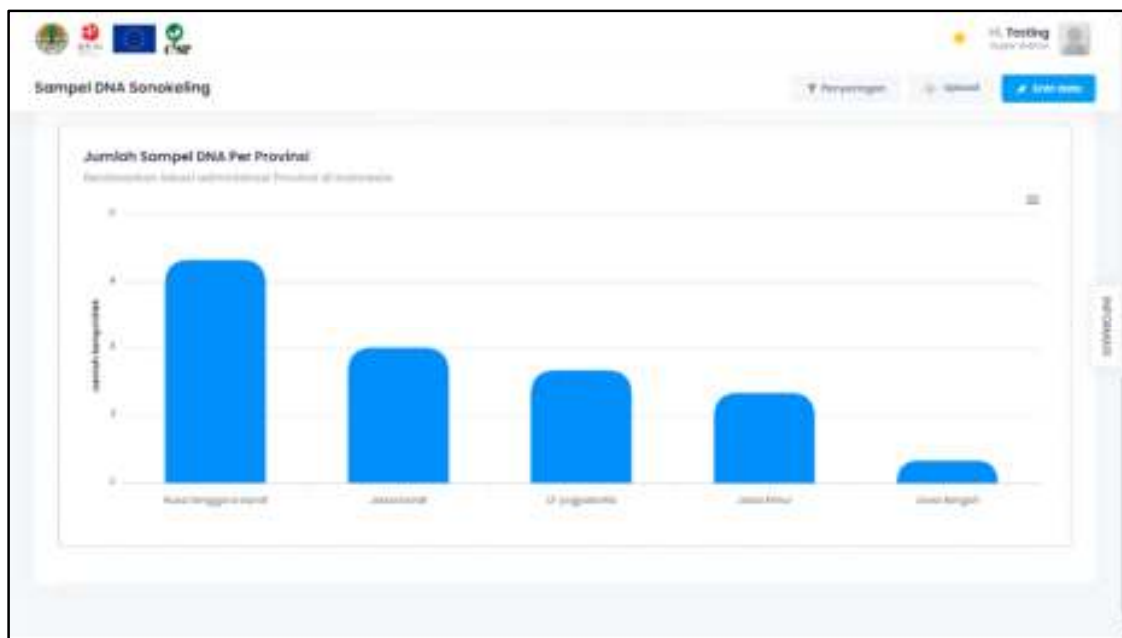
Database sign-in page



A Distribution map of the locations of the *D. latifolia* sample collected



Data summary



Number of DNA samples in each province

Sampel DNA Sonokeling

Stasiun Data Data Primer

No Sampel	Tanggal Koleksi	Kolektor	Jenis Kelamin	No BOK	Haplotype			Aksi
					CYP Intron	rs1044305	rs1044306	
SN1RUP-4.1	30 Mar 2021	Tibek S,aisy A, Wahyu H, Sidiq	Daun	KBY 20	ACTTA	ATAA	AGGA	0*
M01	19 Oct 2020	Tibek Setyowati, Atik S, Herli HR, Suhendar	Daun	KBY 16	CCTTA	ATAA	AGGA	0*
SN1RUP-4.2	1 Apr 2021	Idhu Abdul Ghani, Ahmad Manunggal, Muzalim Pertama, Jonu Jauhari	Daun	KBY 20	ACTTA	ATAA	AGGA	0*
Spl 01	4 Aug 2019	Tika D, Alifah	Daun	KBY 4	ATTTA	ATAA	AGGA	0*
M01	19 Oct 2020	Tibek Setyowati, Atik S, Herli HR, Suhendar	Daun	KBY 16	CCTTA	ATAA	AGGA	0*

Collected primary data

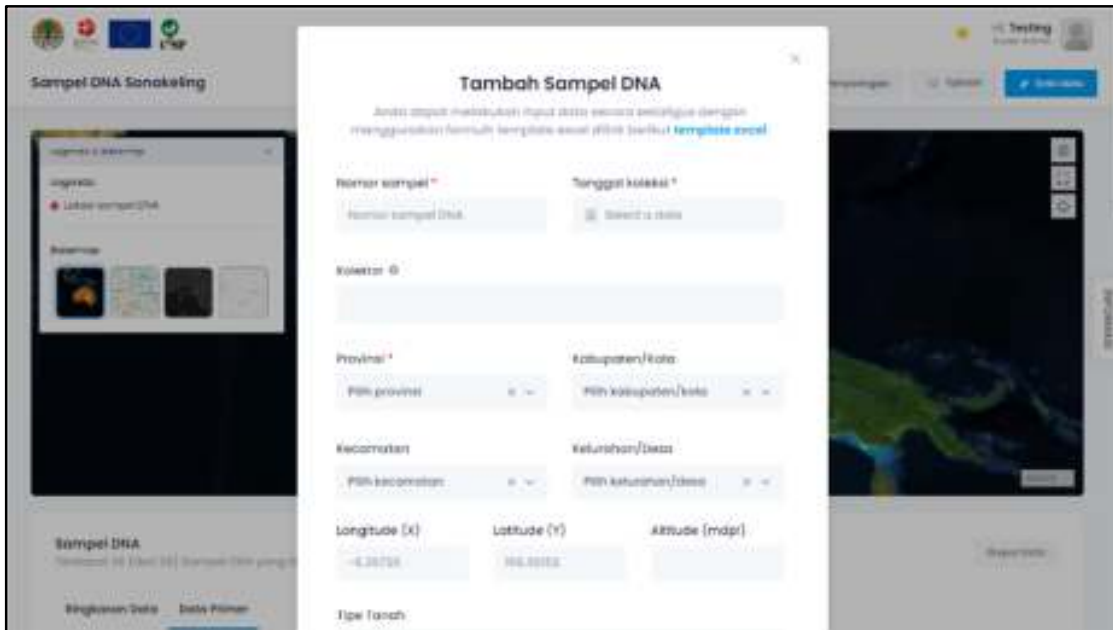
Sampel DNA Sonokeling

Penyaringan Update Tambah data

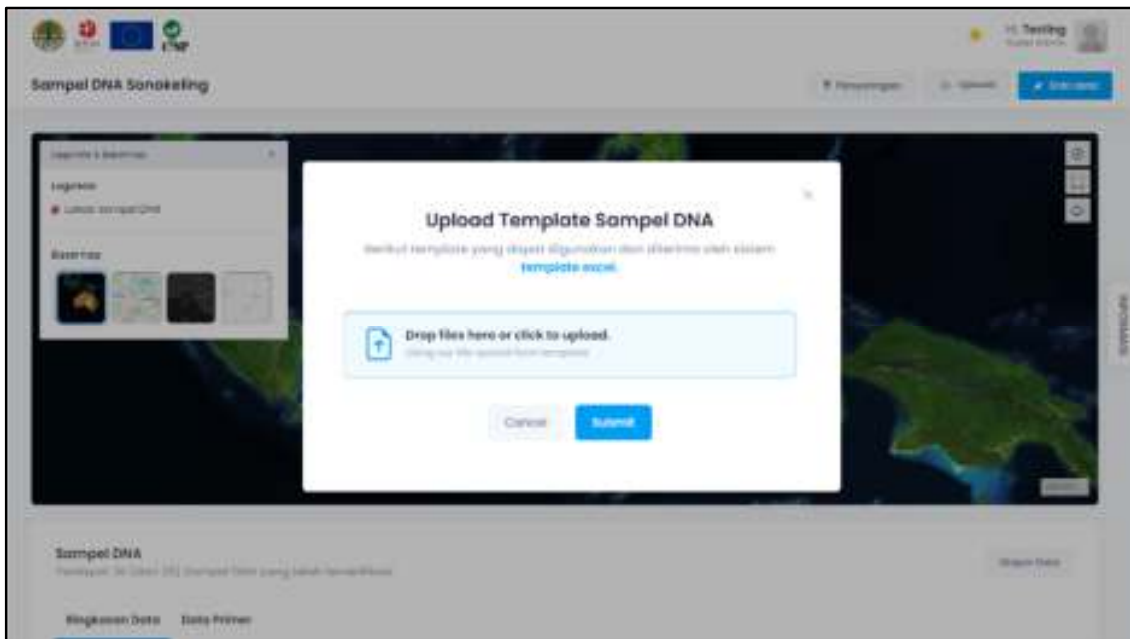
Haplotype				Lokasi				Aksi
rs1044305	rs1044306	CYP Intron	SNP Intron	Provinsi	Kabupaten/Kota	Kecamatan	Kelurahan/Desa	
ATAA	AGGA	00	AAAG	Riau	Sungai Raya	Utara Iwale	Blak	+
ATAA	AGGA	01	AAAG	DI Yogyakarta	Sleman	Plemye	Wondolito	+
ATAA	AGGA	00	AAAG	Riau	Sungai Raya	Jerewah	Nelo	+
ATAA	AGGA	00	AAAG	Riau	Sungai Raya	Sembalo	Semanggeh	+
ATAA	AGGA	01	AAAG	DI Yogyakarta	Sleman	Plyunggi	Nimulye	+

Showing 1 to 5 of 20 records

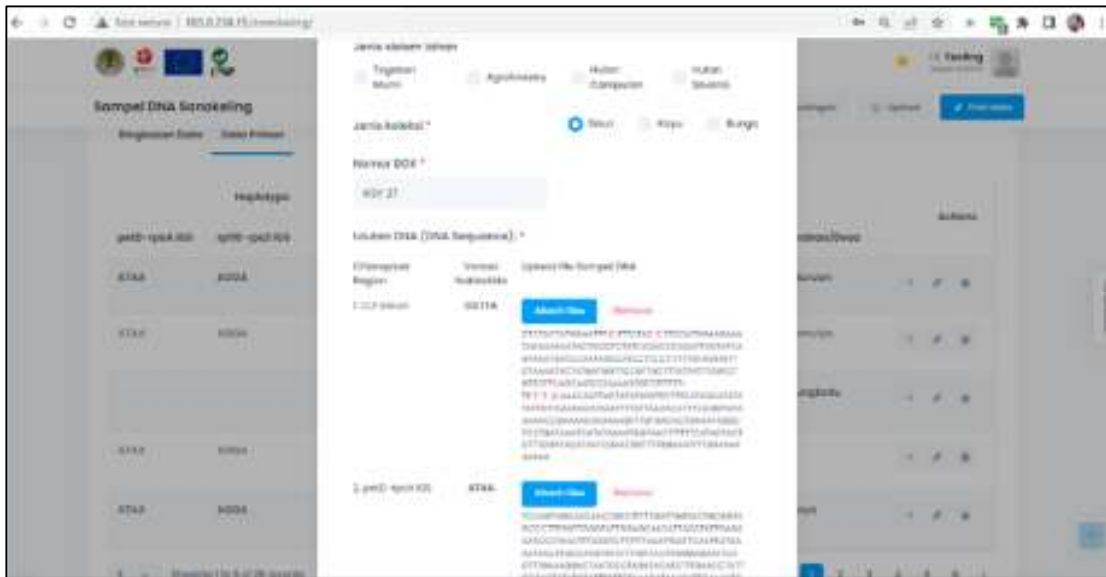
Haplotype data



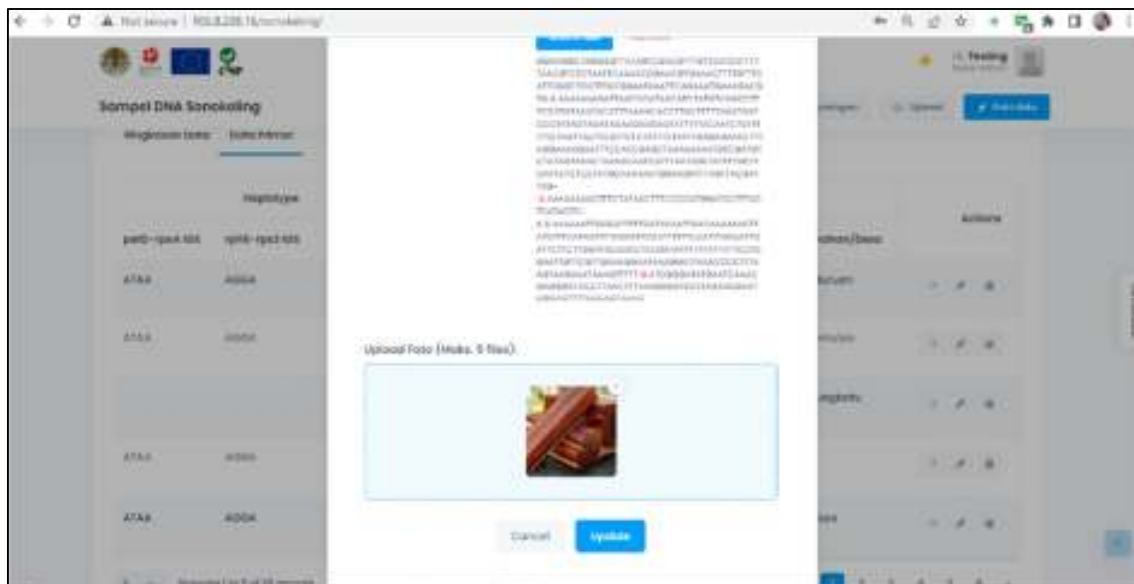
Upload tools to add DNA samples



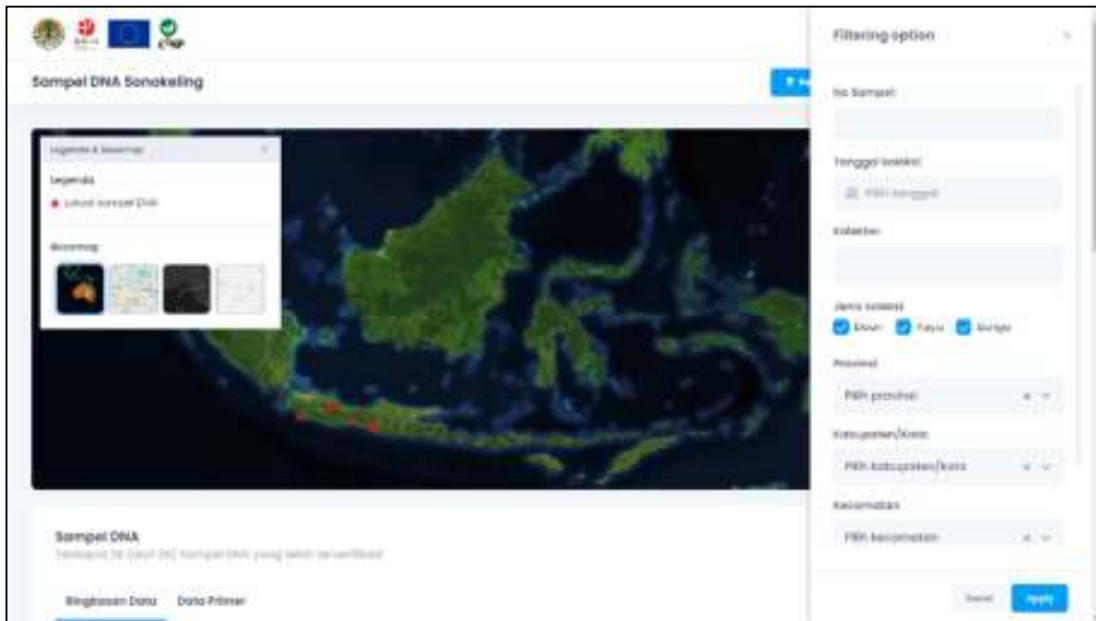
Upload tools



DNA sequencing



DNA sequencing



Filtering options

Annex 6. Workshop photographs



Opening session. Photo by Siti Nurjanah



Participants listening to a presentation. Photo by Siti Nurjanah



Photo session. Photo by Siti Nurjanah



Discussion session with Dr Yulita. Photo by Siti Nurjanah



Presentation by Dr Yulita. Photo by Siti Nurjanah



Discussion led by D. Amir Hamidy. Photo by Siti Nurjanah