CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Seventy-seventh meeting of the Standing Committee
Geneva (Switzerland), 6–10 November 2023

NON-DETRIMENT FINDING FOR *DALBERGIA COCHINCHINENSIS* AND *DALBERGIA OLIVERI* IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

1. This document has been submitted by the Secretariat on behalf of the Lao People's Democratic Republic in relation to agenda item 33.10.*

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Developing CITES non-detriment findings for rosewoods in Lao PDR

Report on the status quo of rosewood species of D. *cochinchinensis* and D. *oliveri* in Lao PDR

Part 1: Literature review

By: National Agriculture and Forestry Research Institute

Supported by:

UN-REDD- Sustainable Forest Trade in Lower Mekong Region, and the CITES Secretariat

December 2022

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THE VERIFICATION REPORT

OF THE STATUS QUO OF ROSEWOOD SPECIES

1. Background

Dalbergia cochinchinensis (D. cochinchinensis) and Dalbergia oliveri (D. oliveri) are the high value species and demand for domestic and international markets. These rosewood species have been harvested wildly for decades and forest land also conversed to other purposes which they are believed as endangered species due to the decreasing of their population. These species of rosewood has been used widely for building houses, furniture, music instruments among other uses.

According to Hartvig et al. 2017, these two species are found in lower Mekong countries namely Thailand, Laos, Vietnam, Cambodia and Myanmar. The species can grow in any types of soil at elevation of 1,200 meters, growing up quickly at young age and slowing down when aging. *D. oliveri and D. Cochinchinensis* can be found mainly in mixed deciduous forests, evergreen forests and dry dipterocarp forests.

The government of Lao PDR currently categorizes the two Dalbergia species as under its Appendix I and disallows harvest from the wild unless otherwise authorized. Under the framework of CITES Article XIII compliance process for Lao People's Democratic Republic, since 1 November 2018, the Standing Committee has established a recommendation to suspend commercial trade in these two Dalbergia species.

> … *shall suspend commercial trade in specimens of the genus Dalbergia spp., including finished products, such as carvings and furniture, from the Lao People's Democratic Republic until Lao PDR makes scientifically based non-detriment findings for trade in the relevant species, including D. cochinchinensis and D. oliveri in the country to the satisfaction of the Secretariat*. (CITES Notification No. 2018/083)"

To unlock this trade sanction, it is necessary to develop a Non-Detriment Finding (NDF) for these two species and report to CITES Secretariat in line with the relevant recommendations under the Article XIII process for Lao PDR.

The objectives of this report are to collect information from existing literature and sources, considered relevant to establishing the NDF. This report is complemented by the report on the mapping of *D. cochinchinensis* and *D. oliveri* occurrence throughout the country, and together, these reports compose the report on the best available information on status quo of rosewood

species of *D. cochinchinensis* and *D. oliveri* in Lao PDR based on literature review, data analysis and field survey, as of 2022.

2. Methodology

Literature review and data analysis on rosewood species of interest in Lao PDR, to understand their biological characteristic and distribution, their status with regards management, conservation and plantation practices.

Literature and data review consisted of review of scientific or technical journals published in both national and international scientific journals, research papers, technical reports and data including from:

- Government departments and ministries at the central level; namely the Ministry of Agriculture and Forestry (MAF) and the Ministry of Natural Resources and Environment (MONRE)
- Educational institutions, research institutes in the country; namely National Forest Research, Agriculture and Rural Development Institute (NAFRI)

3. Results

3.1 Biological characteristic and Distribution

3.1.1 Biological characteristic

D. cochinchinensis (*D. cochinchinensis* Pierre) is a species in the family Fabaceae and the vernacular name is *Kha Gnoung* (ໄມ້ຄະຍຸງ) in Lao language.

Botanical characteristic:

- Tree: 10–30 meters tall.
- Stem: round, bark brown or brown-gray.
- Leaves: alternate, imparipinate, with 7–9 leaflets, leaflet ovate to ovate-lanceolate, base obtuse to round, margin entire, apex acute, upper surface dark green, lower surface greenish, secondary nerves 7–9 pairs.
- Inflorescences: panicle, terminal or subterminal, 10–20 cm long.
- Flowers: white or white-yellowish; (Calyxs: 5. Petals-5, irregular. Stamens: 10, in one bundle. Ovary: superior, glabrous, stipe hairy, 1 locule.)
- Pod: linear-oblong, 1–4-seeded.

D. oliveri (*D. oliveri* Gamble ex Prain) is a species in the family Fabaceae and the vernacular name is *Kham phee leung* (ໄມ້ຄ່າພີ້) in Lao language.

Botanical characteristic:

- Tree: 15–30 meters tall.
- Stem: round, bark gray or dark gray.
- Leaves: alternate, imparipinnate, with 13–17 leaflets, leaflet ovate-oblong to ovate-lanceolate, about 3–5 cm long, 1–2 cm wide, base cuneate to rounded, margin entire, apex obtuse to acute, upper surface dark green, lower surface greenish, secondary nerves 9–12 pairs.
- Inflorescence: panicle, terminal or subterminal, 10–15 cm long.
- Flowers: purple or purple-white. (Calyxs: 5. Petals: 5, irregular. Stamens: 10, in two lateral bundles of 5+5. Ovary: superior, hairy at base and along the suture, stipe hairy, 1 locule.)
- Pod: lanceolate, 1–2-seeded.

3.1.2 Distribution

- Study on population genetic structure of the endemic rosewoods *D. cochinchinensis* and *D. oliveri* (Hartvig et al., 2017)

  The study which explores the genetic structure and reproductive system of the threatened endemic timber species *D. cochinchinensis* and *D. oliveri,* found their populations across Indochina and relates it to landscape characteristics and life-history traits.

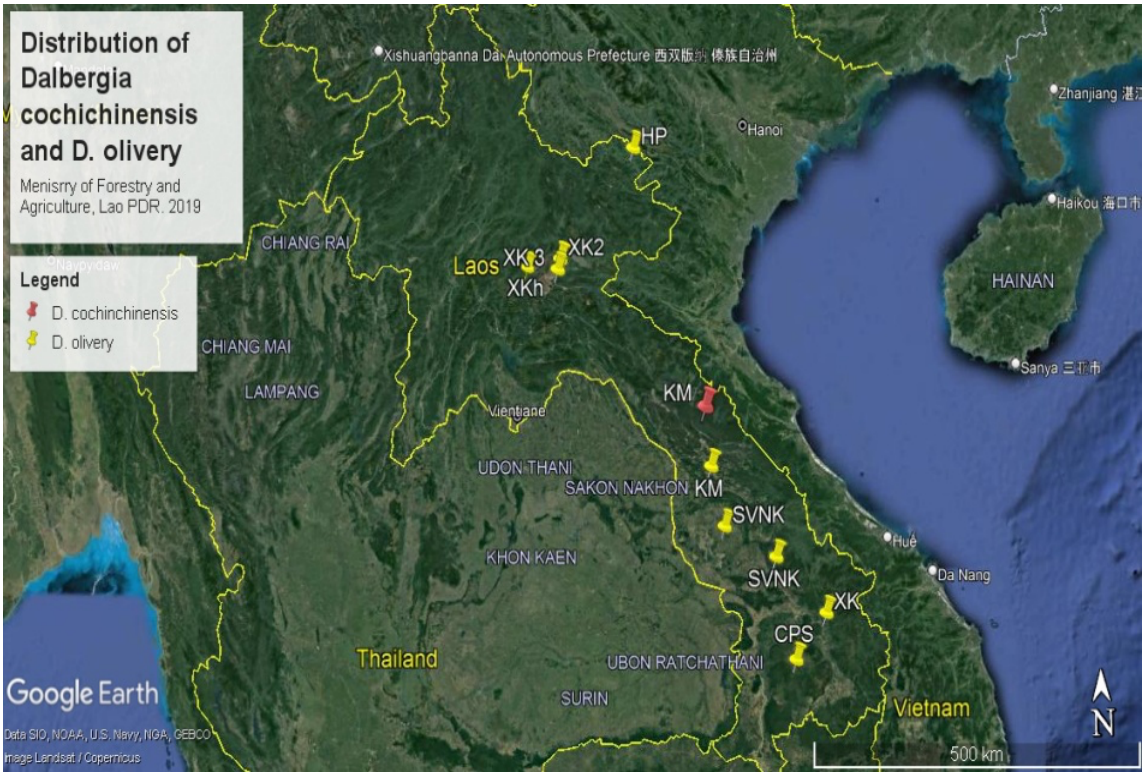
  In Lao PDR, *D. cochinchinensis* is found in mixed deciduous, evergreen, and Dipterocarp forest, at high and low elevation 400 to 600 m. This species is found in the provinces of Xayabouly, Luang Prabang, Vientiane, Vientiane Capital, Bolikxay, Khammouane, Savannakhet, Saravan, Attapeu, Chapasak.

  D. oliveri grows and distributes in evergreen forest, mixed decidouse, dry dipterocarp forest at elevation of 1,200 meters. In Laos can found in Savannakhet and Salavan.

- National forest inventory survey data Department of Forestry, Ministry of Agriculture and Forestry, 2019. (DOF 2019.)

  D. cochinchinensis species was recorded in one sample plots in the Nakai-Nam Theun National Park, Khammouane Province and D. *oliveri*, 27 records were identified in 15 sampling plots across Houaphanh, Xiengkhouang, Khammouane, Savannakhet, Sekong and Champassak provinces (Map 1; DoF, 2019). This is from the total number of sampled plot surveyed in the country of 511 plots (1,963 m^2 / plot), totaling 100 ha, where all tree species that were found on the inventory sampling plots were recorded.

Map 1. Distribution of 2 rosewood in Laos based on DoF 2019



- Taxonomy study on plant bio-diversity in Lao PDR (a continuing collaborative research funded and supported by different donors and projects) conducted by the NUoL Faculty of Forest Science, Faculty of Natural Sciences, Forest Research Center, Eco-Bio Technology Institute, and Bio-Technology and Ecology Institute 1990-2017

  The study identified *D. cochinchinensis* distributed in Khammouan, Savannakhet and Luang Phra Bang provinces.[1]

- According to (Niyomdham et al. 1997), Indochina is a home to 28 indigenous species of Dalbergia genus. Vidal (1956-60) sampled a second group of semi-evergreen forest habitats on terrerouge soils derived from basaltic parent material with sampling sites located in southern Lao at Phou Ba Chieng to the east of Pakse, at Dong Houa Sao to the south of Pakse, and at Phang Ham in Salavane Province and found that this species are especially dominant in evergreen forest, either mixed deciduous forest or semi-evergreen forest, Degraded Montane Forests, and Deciduous Dipterocarp Forests and Woodlands. Over the past fifty years, there have been increasing forest destruction and degradation of forest especially evergreen forest.

[1] While the study identified Luang Prabang province as hosting D. cochinchinensis, this has not been validated in the study or through any other publications that are known to the NAFRI study team. In this regard, Luang Prabang province is not recognized as hosting the species in a natural habitat.

- Report on species/country combinations selected for review by the Plants Committee following CoP17 (UNEP-WCMC. 2018).

  D. cochinchinensis was found in conservation, production and protection areas from Vientiane capital, Vientiane province, Bolikhamxay, southeast of Khammouan, Savannakhet, Salavan, Champasak, Xekong and Attapue provinces.

- Previous field studies undertaken have identified that in Vientiane capital, two sites of Source code A and D *D. cochinchinensis* were identified (Map 01). These two sites are the research oriented plantations sites under the Forest Research Center of NAFRI intended for genetic resources conservation and the demonstration forest area of the Faculty of Forest Science, National University of Lao PDR in Sangthong district. There is research data from the Forest Research Center on Tree Seed Source Assessment, 2017, so these plantations were not subject to inventory under this study. The results of the past research were used for the study.
- Studies in Nong and Thapangthong districts, Savannakhet province under the NAFRI-Darwin Dalbergia project, 2018-2021 (Bounthithiphonh, 2019.)

  The two species of rosewood were found in natural forests in Dong Phou Vieng National Protected Area, Xe Ban Nuan National Protected Area (conservation forests) in the three following villages:
  - Savue village, Nong district, Dong Phou Vieng NPA: In 20 ha of the study area, *D. cochinchinensis* were found as follows: 514 trees were found. Two trees had less than diameter at breast height (DBH) of 9 cm , while 487 trees had less than DBH of 5 cm (Figure 1);

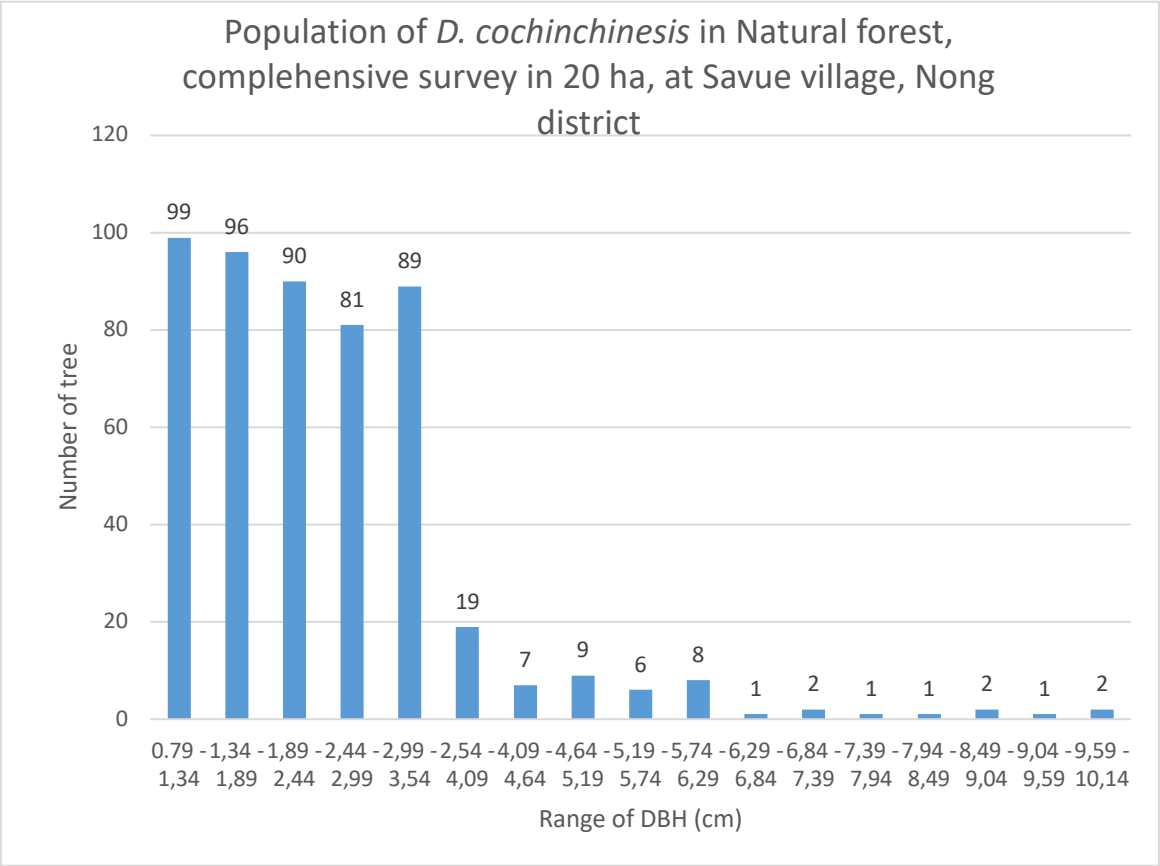


Figure 1 Population of D. cochinchinesis in 2019, in Dongphouvieng NPA, Savue village, Nong district, Savannakhet province

- *Labao Khok village, Nong district, Dong Phou Vieng NPA: In the study area of 20 ha, D. cochinchinensis were found as follows: 63 trees were found. Six trees with DBH of less than 9 cm, five trees with DBH of less than 15 cm (qualifying them to be breeder trees), and 53 trees with less than 5 cm DBH (Figure 2).*

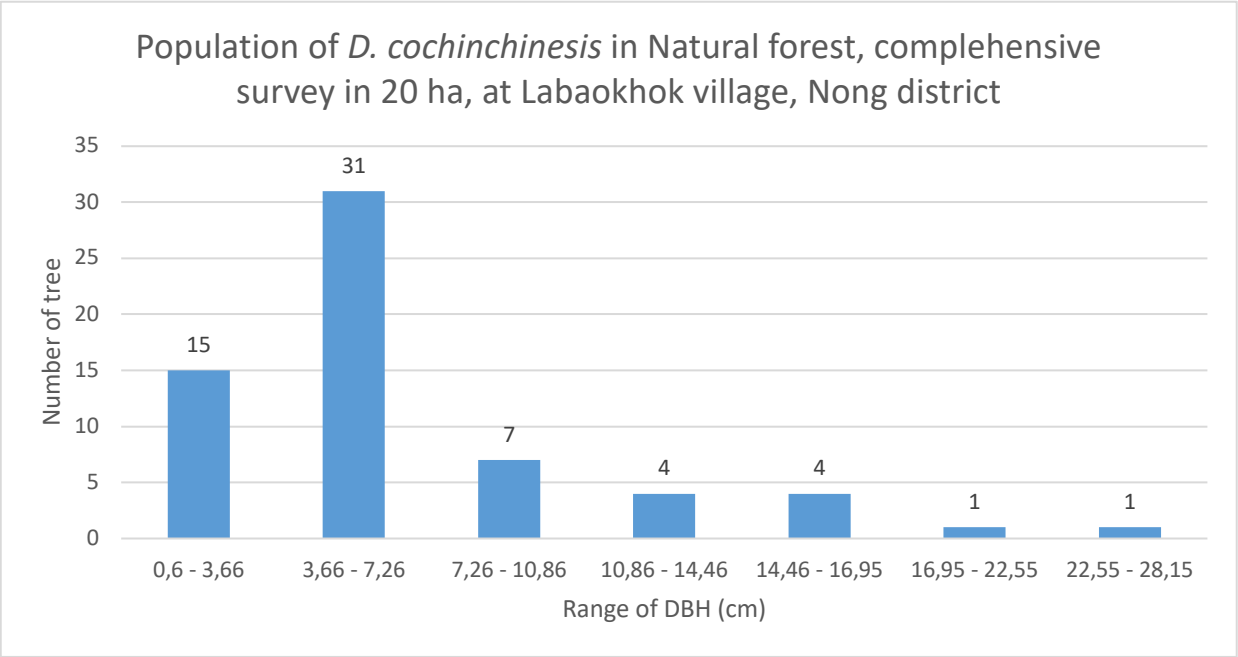


Figure 2 Population of D. cochinchinesis in 2019, in Dongphouvieng NPA, Labaokhok village, Nong district, Savannakhet province

- Comprehensive survey had been conducted in two areas at Xekue village, Thapangthong district such as Phou Hong (belong to Xebangnouan NPA) and Houay Ayoun Mountain (belonging to National Production Forest). At Phou Hong NPA, 51 individuals of D. *oliveri* were identified in total area of 20 ha including 18 trees with DBH of 19,4 - 29 cm, which is already able to produce seeds (see figure 3). While, at Houay Ayoun mountain, 42 trees of *D. cochinchinensis* were identified in a total area of 20 ha including 10 trees with a DBH of about 6,1 to 9,1 cm, which is already able to produce seeds (see figure 4).

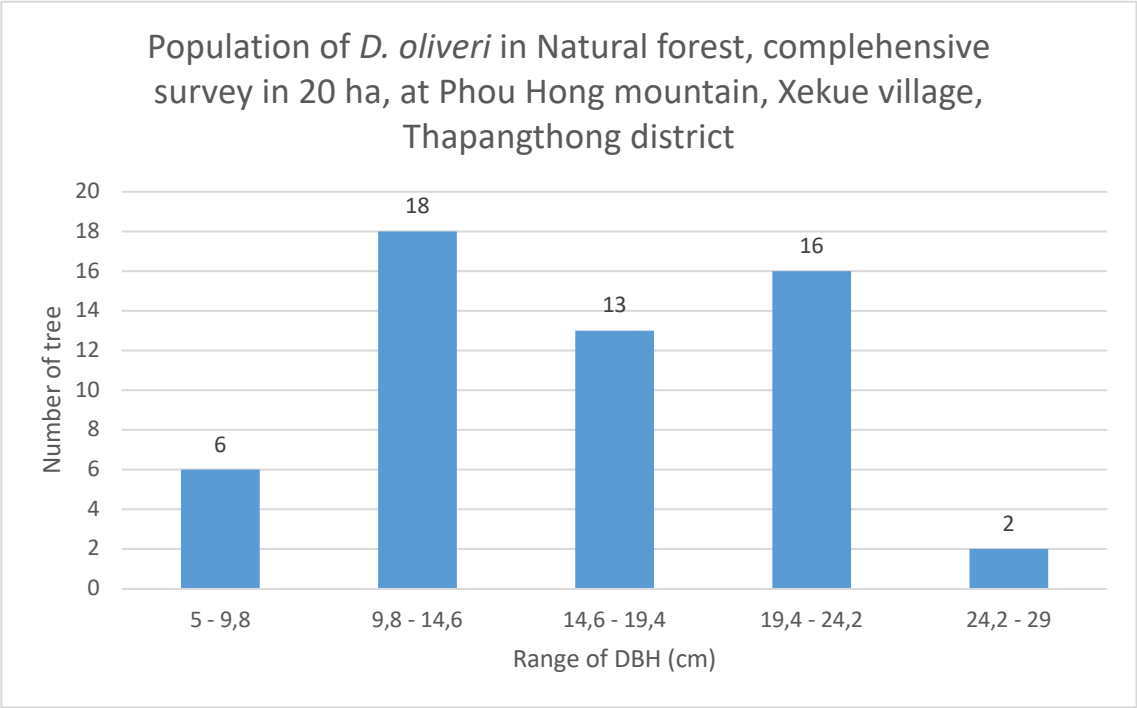


Figure 3 Population of D. oliveri in 2020, in Phou Hong mountain of Xe Bang Nuan NPA buffer zone

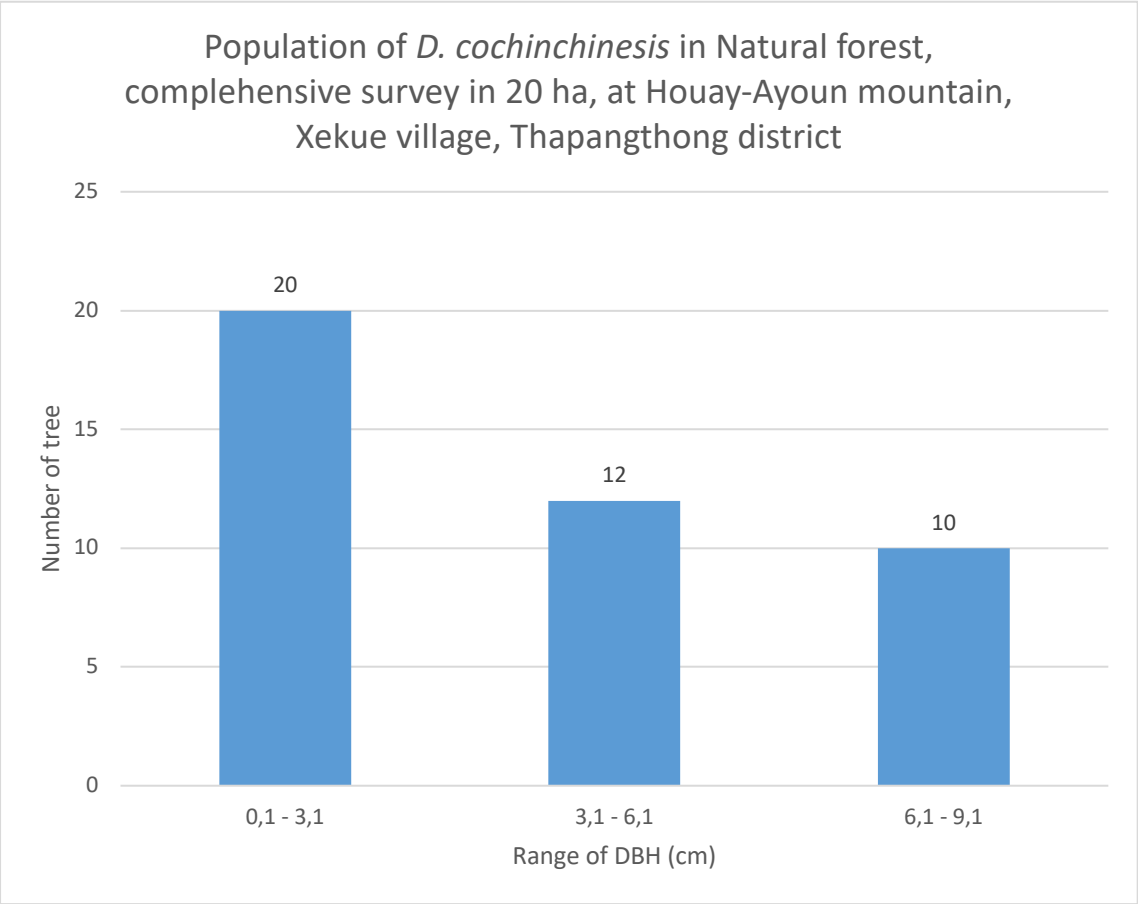


Figure 4 Population of D. cochinchinnensis in 2020 in Seku village

- Interviews under NAFRI-Darwin Dalbergia project, May 2019:

  Interviews were conducted with communities Thapanthong district, Savannaket province to understand the status of Dalbergia population and their use in the locality – with communities located near a national protected area, and the other with communities located within a national production forest.

  D. cochinchinensis and *D. oliveri* are native to this area, and are commonly found in forest areas and agriculture lands, including protected areas and national production forests.

  The ecological characteristics of the forests in this area are mixed deciduous with shallow soil surface, which is vulnerable to rapid flooding and drought, forest land allocation is not yet implemented, which is one of the reasons for the unplanned use of forest resources.

  In Xekue village, Thapangthong district, in the buffer zone in Xe Bang Nuan National Protected Area:

- 1998-2002: the population of *D. cochinchinensis* was still very large and the use by the local communities were limited for their consumption, and not for the market.
- 2002-2009: *D. cochinchinensis* with a DBH of over 40 cm were found in large numbers in the village area;
- 2009-2014: the use of *D. cochinchinensis* with a diameter of 20-50 cm became widespread;
- 2015: it appeared that *D. cochinchinensis* with a diameter of over 20 cm could not be found in the forest area of the locality.

In communities within the National Production Forests:

- 2004-2009: *D. cochinchinensis* and *D. oliveri* with of DBH 30-50cm were still found;

2014 to the present: *D. cochinchinensis* and *D. oliveri* with DBH over 10cm could not be found

3.2 Management

The Government of Laos have closely promoted and guided the implementation of the management, protection, development and use of forests and forest resources as well as sustainable tree species by issuing a number of laws and regulations as a basis for such work.

In 2000 *D. cochinchinensis* was identified through research to be added to the list of tree species for the purpose of conservation and seed source establishment, improvement or procurement of seeds in Lao PDR (Theppavong et al., 1999).

In 2007, the Ministry of Agriculture and Forestry issued Decision No. 0116 / MAF, dated 7/5/2007 which stipulates three tree species lists with the following three categories (ie MAF Appendix I, II and III).

MAF-Appendix I: refers to rare, medicinal, endangered, endemic, slow-growing, endangered, enduring species, some of which are listed in the International Convention on Trade in Endangered Species of Wild Fauna and Flora (CITES).

MAF-Appendix II: refers to the species of trees that grow and reproduce in some areas and grow slowly in nature, with moderately durable woods

MAF-Appendix III: Refers to species that grow, propagate and grow well in natural, low-tolerance woods

In 2008, an order of the prime minister's office was issued to prohibit harvesting of *D. cochinchinensis* (Order no17/PM, Prime Minister's Office of Lao PDR, 2008).

According to the Decision no. 0448/MAF (06 April 2021), the two species of Dalbergia (*D. cochinchinensis* and *D. oliveri*) are listed under MAF-Appendix I, strictly prohibiting harvest from the wild without approval from government.

MAF manages 51 National Production Forests Areas. In 2009-2010 and 2010-2011, a total of 27,997 cubic meters of timber were harvested from these production forests – the inclusion of the two Dalbergia species among these is not known. Since 2013, logging of natural forests in production forests has been suspended through the Order No. 31 / PM, dated 5 November 2013. This has effectively closed the legal harvesting of natural forests for commercial purposes througout the country. This means that the main legal avenue for harvesting of natural forests still being permitted by the government is for conversion of land use into other forms – namely for projects such as infrastructure and mining.

3.3 Conservation and Plantations

Current efforts in the country on conservation of the two rosewood species focus on the creation of conservation areas. The establishment of protection forest areas is a contribution to the conservation of these species, such as the protection forest area that covers areas native for these two species from Bolikhamxay to Attapeu provinces, which has a total of 10 national protected area (conservation forests).

Under the NAFRI-Darwin Dalbergia project, in 2021 two village sacred forests and two national protected area sites have been identified in Nong and Thapangthong districts, Savannakhet province, all of which have been restored by enrichment planting.

Under the NAFRI-Darwin Dalbergia project, a study was conducted on following traditional rules to strictly protect the community conservation sites with *D. cochinchinensis* and *D. oliveri*, in Daen Sa Tueng village, Thapangthong district, Savannakhet province. Here, the population of these trees satisfy requirements to act as ground for tree breeding.

Between 1975 to 2015, Lao PDR established 111 tree seed sources for various tree species, including three sources of *D. cochinchinensis* (Namphao and Thongchaleun villages, in Khamkeut district, Bolikhamxay province, and Nonglom village, Kaysone district in Savannakhet province); and one seed source for *D. oliveri* (in Houyhuang village, Khong district, Champasak province). However, a re-assessment of the status of these seed sources in 2017 found that only 76 seed sources still existed; the three seed sources for *D. cochinchinensis*

were all converted by infrastructure projects, among them one still hosted 24 trees in 60 hectares of land however, the ability of the site to act as a seed source has been degraded. The seed source for *D. oliveri* remains. As of 2018, therefore, only one seed sources of *D. cochinchinensis* exists in the country at the Forest Research Center of NAFRI hosting 62 breeding trees among 189 trees in the total area of one hectare. DBH of these trees range from 28-39.5 cm.

In 2000, under the efforts of the Forest Research Center of NAFRI, 38.7 kg of *D. cochinchinensis* and *D*. *oliveri* seeds were collected producing a total of over 23 million seedlings. *D. cochinchinensis* seeds were collected in Savannakhet and Champassak provinces, and *D*. *oliveri* seeds were collected in Saravan, Vientiane, Khammouane, Savannakhet and Champassak provinces.

Under the forest restoration efforts coordinated by the Plantation Promotion and Reforestation Promotion Division of DOF, the two Dalbergia species have been planted widely in degraded areas inside and outside of the three forest categories, amongst other species. The approaches used for the restoration include natural regeneration and enrichment planting by direct seed sowing, and supplementary planting. However, the exact area and figures of planting of the two species are not well documented.

Between 1980-2021, the Forest Research Center of NAFRI planted *D. cochinchinensis and D. oliveri* in an experimental plantation in Naxaithong District, Vientiane Capital.

In 1998, the Faculty of Forestry of the National University of Laos planted an experimental 1,100 *D. cochinchinensis* on a one hectare plot in Ban Napo, Sangthong District, Vientiane Capital, and *D. oliveri* on a two hectare plot (number of seedlings planted is unknown for *D. oliveri*). Currently, 400 *D. cochinchinensis* are surviving with a height of about 25 m and DBH of 30 cm. This case demonstrates the patriarchal nature of the saplings and the sapwood, and a successful method for the conservation of the genetic resources (Faculty of Forest Sciences, 2020).

Plantations of the two Dalbergia species exist in the country, however, documentation on the magnitude or location is sparse. The Ministry of Agriculture and Forestry has implemented a regulation requiring the registration of plantations within three years of planting, in order for future harvest and sales. At the time of writing, the implementation and enforcement of this regulation remains weak, and therefore records of plantation of these two species could not be obtained.

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Developing CITES Non-Detriment Findings for Rosewoods in Lao PDR

Report on the status quo of rosewood species of D. cochinchinensis and D. oliveri in Lao PDR

Part 2:
Report on Updating the Occurrence and Maps of *D. cochinchinensis* and *D. oliveri* in Central to Southern Lao PDR

By: National Agriculture and Forestry Research Institute

Supported by:

UN-REDD- Sustainable Forest Trade in Lower Mekong Region, and the CITES Secretariat

December 2022

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List of acronyms

ATP	Attapue province
BLKS	Borlikhamsay province
CPK	Champasack province
KM	Khammouane province
SLV	Salavan province
SVK	Savannakhet province
VNT	Vientiane capital
XK	Xekong

I. Background

The government of Lao PDR currently categorizes the two Dalbergia species of *D. cochinchinensis* and *D. oliveri* as under its Appendix I prohibiting harvest from the wild unless otherwise authorized. Under the framework of CITES Article XIII compliance process for Lao People's Democratic Republic, since 1 November 2018, the Standing Committee has established a recommendation to suspend commercial trade in these two Dalbergia species.

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To unlock this trade sanction, Lao PDR needs to develop a Non-Detriment Finding (NDF) and report to CITES Secretariat in line with the relevant recommendations under the Article XIII process for Lao PDR.

Under the UN-REDD Lower Mekong Initiative - Sustainable Forest Trade in the Lower Mekong Region, in 2021, FAO and the National Agriculture and Forestry Research Center (NAFRI), entered into a Letter of Agreement with the objective of developing an NDF for the two sanctioned rosewood species. Technical support was provided from FAO as well as from the CITES Secretariat.

This report is Part 2 of a set of two reports which together compose the report on the best available information on status quo of rosewood species of *D. cochinchinensis* and *D. oliveri* in Lao PDR based on literature review, data analysis and field survey, as of 2022.

This report presents the result of field survey of occurrence for population of two Dalbergia species namley, *Dalbergia cochichinensis* (*D. cochinchinensis*)and *Dalbergia oliveri* (*D. oliveri*), which took place in 2022, covering six provinces (Borlikhamsay, Khammouane, Savannakhet, Salavan , Champasack and Attapeau)from central to southern parts of Lao PDR. The report also incorporates information from two provinces (Vientiane capital and Xekong province) based on the existing data from literature review from previous study. The main purpose of this report is to map and describe occurrence, distribution and population status of two Dalbergia in Lao PDR.

According to the results of literature review process (refer to Report 1), as the team had reviewed technical reports, scientific paper, type specimen, raw data and database of national forest inventory and planning, as well as related government documents from province and district levels, areas were identified with existing populations of the two Dalbergia species – categorized in three CITES sources codes, according to the nature of their occurrence. These categories are:

- Wild or occurring naturally in natural forests (Source code W)
- Artificially propagated or occurring in planted or plantation form (Source codes A and D), and
- Assisted production, or occurring naturally but outside natural forests (Source code Y).

From the survey and collected information, it is evident that the two rosewood species have been harvested heavily in the last decades both for the purpose of timber use, as well as for conversion of the land on which they occur into other land uses. The two species in their natural habitat are now endangered in the country, but at the same time there are some successful efforts towards their convservation as well as for establishment of plantatations particularly in the case of *D. cochinchinensis*.

1.1. Objective

Mapping of occurrence including the following:

- Updated maps to indicate the occurrence of two Dalbergia species of interest in Lao PDR, aligned with national forest categorization. Based on the results of field investigations, distribution/occurrence map is developed and the map will recognize the approximate estimation in quantity per area; Location of their occurrences.
- Approximated area where their population still existing or remaining;
- Description and mapping of rosewood occurrence per national forest designation category (production and protection forests, and national biodiversity conservation areas) and references.

II. Methodology

The NAFRI and NUOL combined field survey team collected data through interviews and through field surveys inventorying population of the two Dalbergia tree species acCodeing to the three CITES source codes applied in this study.

Table 1 CITES source codes applied in the study:

CITES Source code	CITES description	Context description in Lao PDR
Source code W	Wild	Occurring naturally in natural forests
Source code A	Artificially propagated plant	Plantations – may occur in any of the three forest categories or outside though more likely to occur in production forest areas. The purpose of the plantation include both commercial and other purposes.

		They propagated from seeds which derived from unknown seed sources, narrative genetic. Currently found as integrated planting with other tree species and also agroforestry system. Very rare to find in the form of monospecific platnation.
Source code Y	Plant obtained through assisted production	Specimen occur in different types of land uses outside natural forests such as farm land (rice paddy areas, upland rice areas, cash crop production areas (cassava), fruit tree farms), urban environment (home gardens, house back yard gardens, private home areas, school areas, office areas and etc.). Natural forests here refers to the actual land cover irrespective of the administrative designation of the land. The land here may be either private or public (State) land. Originally, specimens were collected or grown using wild materials (e.g. root stocks, stumps, and seeds), and maintained with human intervention. The exact type and level of human interaction varies, however, these specimen have not been propagated, and do not meet the definition of plantations (Source codes A). The purpose of management of these specimens are considered various. Notwithstanding, the legal framework of Lao PDR allows for the use of such specimen for commercial purposes where this has been approved from relevant authorities through due processes.

2.1 Interview and literature-based information collection

For the information collection related to the existence of the two Dalbergia species, the team interviewed related sectors in the Provincial Department of Agriculture and Forestry Offices (PAFO) and District Agriculture and Forestry Offices (DAFO) in 13 districts in six provinces.

Information obtained through similar interviewes in two other provinces, funded under separate sources is also presented here.

There are keys division under PAFO and DAFO had been interviewed include the Forest section and Forest Inspection section. The team had dispatched permission letter to PAFO and DAFO prior to the visit, invited representatives from key sectors in the forestry sector, conducted half day interviews per province and district office. The team also contacted land owners and other stakeholders involved in tree plantation (location, owner, planting regime etc.), forest restoration, forest inventory, forest inspection and forest inventory.

Key information collected from the interviews include forest restoration status, existence of timber confiscated (to understand if, when and how much these species have existed in the past), national forest inventory data, plantation, forest management related to population of two Dalbergia tree species.

Ultimately, the field survey sites were identified based on information obtained or confirmed through the interviews and the information obtained through the literature review (see Report 1).

Limitations:

- Information provided by provinces and districts were varied, often incomplete and often difficult to interpret with what is assumed to be confused documentation with errors in placing of commas and lacking information on unit.
- Specifically for Source code W, the general area of potential occurrence of the Dalbergia species is identified in terms of general locations, and no specific coordinates or area information could be made available.
- For Source code A, information obtained through these interviews were often plans (eg., plans for planting), with less information on the actual implementation (eg., implementation of the actual volume/area/location planted.) This limited the ability of the team to map or estimate overall volumes of Source code A, outside the areas inventoried.

2.2 Field surveys

The target areas and survey sites were selected based interviewed information from PAFO and DAFO and literature review (see Report 1) on occurrence of two Dalbergia species in each province, the team visited.

For selecting the sites, Source codes A and Y were prioritized and surveyed within the available resources (time, funding and personnel), considering the limited available knowledge for these two source codes, as compared to Source code W, for which the low population status is already well acknowledged by all including the CITES National Authorities.

2.2.1 Source code W (wild specimens from natural forests)

Based on information from PAFO and DAFO, as well as information from the literature review, general areas favorable for the natural survival of the species were identified (areas within districts or whole provinces – Table 1). PAFO and DAFO informants were asked to identify two types of natural habitat areas for the plot inventory; i) high density areas (representing areas that can host the species with highest occurrence potential), and ii) low density areas (representing areas that have been over-harvested or other forms of degradation).

It is important to note that the sample size of the surveyed areas relative to the potential area is unknown (ie., the size of the potential natural habitat was undetermined.) The areas that were identified as general areas favorable for the natural survival of these species but were not inventoried are displayed in the maps (Maps 2-7).

Of the identified areas of these two representative types, the actual surveyed areas were 17 noting that access was constrained to only those eligible areas (accessible areas) recommended by PAFOs and DAFOs. Access to some areas including those expected to have existing large populations of *D. cochinchinensis* was not permitted, due to their status such as national special military zones (see location in map 6 of Champasack province).

The inventory design applied for Source code W:

- Low density areas - transect line survey were applied: 200 m width and 1,000 m length (total number of transect surveys: 14);
- High density areas - square sample plots were applied: main plots of 40 meters * 40 meters and sub-plots of 10 m * 10 m (total number of main plots: 3)

2.2.2 Source code A (artificially propagated specimens/ plantations)

Based on information from the PAFO and DAFO, planations that have exceeded at least three years after planting were selected for survey. The total area of plantations known to exist per village are listed in Table 15. Of the plantation site, survey sites were selected based on size of plantation, namely based on the criteria of i) biggest planation in that district, and ii) smallest plantation in that district (including planting of a few individual trees that would not meet the definition of forests; ie, > 0.5ha). These criteria were used to understand the results of plantations where resources are abundant (ie., biggest plantations) and where resources are limited (ie., smallest plantations).

Inventory design applied for Source code A:

- If the area is under 1 ha, all trees were measured (14 sites)
- If the area is over 1 ha, at least 100 - 200 trees were measured (7 sites)

2.2.3 Source code Y (assisted specimens outside forests)

Based on information from the PAFO and DAFO as well as from literature review – including past field reports on seed collection of the Dalbergia species – inventories were conducted in as many areas as resources allowed. Inventories sites were selected based on size of area; the largest areas known; and density of the two species (using the guidance of no more than 500m between trees – the criteria for seed collection); and where more than 20 individual trees of either species occurred.

For locations that were visited through previous research field surveys applying the same protocol, the field surveys were not repeated in this study, but results of previous field surveys were used in this report.

Inventory design applied for Source code Y:

- Sites were inventoried by recording number of individual trees, recorded Diameter at Breast Height (DBH) and height of trees.
- Coordinates were recorded at each occurrence site of two Dalbergia species.
- The following DBH classes were applied;
    - Plants with a height < 1 m and a DBH < 2cm: regarded as seedlings
    - Plants with a height > 1 m and a DBH < 5cm: saplings
    - Plants with DBH classes 6-15 and 16-20 and >21cm: trees

2.3 Data analysis and mapping:

2.3.1 Mapping the occurrence and population status:

Locations of occurrence of the two Dalbergia species obtained from recent literature, and field survey is the basis for developing the maps, showing the distribution occurrences. The maps are displayed according to occurrence by the three CITES source codes.

This information on occurrence is overlaid on the boundary of 3 forest categories and administration boundary. We established maps of distribution of occurrence by province.

III. Results:

3.1 Interview and literature-based information collection:

Occurrence and status of populations of the two Dalbergia species has been studied through a case study in Bolikhamxay, Khammouan, Savannakhet, Salavan, Attapue and Champasak provinces (conducted by the NAFRI Forest Research Center team as apart of Darwin Dalbergia genetic conservation project 2018-2021 – see also Report 1). AcCodeing to this study, *D. cochinchinensis* is found in the three forest types in Bolikhamxay, Khammouan, Savannakhet,

Salavan, Attapue and Champasak provinces. *D. oliveri* is found in three forest types in Bolikhamxay, Khammouan, Savannakhet, Salavan, Attapue and Champasak provinces.

Based on the interviewers of six PAFOs and 24 DAFOs, in these provinces, habitats of *D. cochinchinensis* were heavily disturbed and the mature tree population has significantly declined. Mostly found in the form of source code W and the status of their habitat and population are known to be very poor in all six provinces.

The following tables 1-3 display the areas and sites that were identified through the interviews with PAFO and DAFOs as having the dalbergia species acCodeing to the three source codes.

Table 2 Habitats of Source code W Dalbergia species as identified through interviews

Province	district	Area (ha)	Inventoried (yes/no) or observed*	Remarks
Borlikhamsay	Khamkuet	NA	Observation & Interview	Low occurrence and dispersed
Khammouan	Boualapha	NA	Yes	Observation, Low occurrence and dispersed
	Nakai		Yes	
Savannakhet	Nong	NA	Yes	Observation, Low occurrence and dispersed
	Xepon		Yes	Low occurrence and dispersed
	Phin		Yes	Low occurrence and dispersed
	Thapangthong		Yes	Low occurrence and dispersed
Salavan	Toumlan	NA	No	Observation, Low occurrence and dispersed
	Vapi		No	Low occurrence and dispersed
	Lakhonepheng		No	Low occurrence and dispersed
	Ta-Oy		No	Low occurrence and dispersed
	Samouay		No	Low occurrence and dispersed
	Lao-Ngam		Yes	Low occurrence and dispersed
Champasack	Khong	NA	Yes	Observation, medium occurrence and dispersed

	Pathoumphone		No	Low occurrence and dispersed
	Nakhonepakse (Xiengthong Protected Area)		No	Low occurrence and dispersed
	Mounlapamok		Yes	Low occurrence and dispersed
Attapue	Xaysettha	NA	Yes	Observation, Low occurrence and dispersed
	Phouvong		Yes	Low occurrence and dispersed
	Sanxay		No	Low occurrence and dispersed
	Sanamxay		No	Low occurrence and dispersed

Table 3 Locations of Source code A as identified through interviews

Province	District	Area (ha)	Inventoried (yes/no)	Planting regime
Vientiane capital	Sangthong	8	Inventoried (in past studies)	Single species
	Nasaythong	2	Inventoried (in past studies)	Single species
Borlikhamsay	Borlikhan	10	Yes	Mixed with other species
	Khamkuet	5	Yes	Mixed with other species
	Pakkading	5	Yes	Mixed with other species
	Paksan	5	Yes	Mixed with other species
	Thaphabath	9	Yes	
Khammouan	Boualapha	2	Yes	Mixed with other species
	Nakai	1	Yes	Mixed with other species
Savannakhet	Atsaphone	1	Yes	Mixed with other species
	Champhone	NA	No	Mixed with other species
	Kaisone city	2	Yes	Mixed with other species
Salavan	Salavan	5	Yes	Mixed with other species
	Vapi	3	Yes	Mixed with other species
Champasack	Pakse city	8	Yes	Mixed with other species
	Paksong	NA	No	Mixed with other species
Attapue	Samakkhixay	3	Yes	Urban trees
	Xaysettha	15	Yes	Mixed with other species

Table 4 Habitats of Source code Y (assisted production) as identified through interviews

Province	District	Area (ha)	Inventoried (yes/no) or Observed	Remarks
Borlikhamsay	Khamkuet	1,000 ha	Yes	High occurrence but dispersed
Khammouan	Boualapha	100	Yes	Low occurrence and dispersed
	Nakai	20	Yes	Low occurrence and dispersed
Savannakhet	Nong	1,000	Yes	High occurrence but dispersed
	Phin	20	Yes	High occurrence but dispersed
	Thapangthong	1,000	Yes	High occurrence but dispersed
	Xepon	500	Yes	High occurrence but dispersed
Salavan	Lakhonepheng	100	Yes	High occurrence but dispersed
	Lao-Ngam	NA	No	Low occurrence and dispersed
	Samouay	700	Yes	High occurrence but dispersed
	Ta-Oy	500	Yes	High occurrence but dispersed
	Toumlan	20	Yes	Low occurrence and dispersed
	Vapi	30	Yes	Low occurrence and dispersed
Champasack	Khong	100	Yes	Low occurrence and dispersed
	Mounlapamok	100	Yes	Low occurrence and dispersed
	Nakhonepakse (Xiengthong Protected Area)	NA	No	
	Pathoumphone	20	Yes	Low occurrence and dispersed
Attapue	Phouvong	25	Yes	High occurrence but dispersed
	Sanamxay	NA	No	Low occurrence and dispersed
	Sanxay	NA	No	Low occurrence and dispersed
	Xaysettha	25	Yes	Low occurrence and dispersed
Xekong	Lamam	5	Yes	Low occurrence and dispersed

3.2 Information collection from field survey

The field survey of occurrence, distribution and population status of two Dalbergia species were done from 6 - 26 March 2022, by NAFRI and NUOL team. In this survey, total of 6 provinces are our target areas covering Bolikhamxai, Khammouane, Savannakheth, Salavanh, Attapue and Champasack provinces and 24 districts are the survey sites and 52 village were involved in the survey plots. (Refer to Table f in the Annex for the full list of field inventory plot locations).

D. cochinchinensis of the three source codes were found at total 23 survey sites or districts, at 51 villages and 183 survey plots. Most of them were found in Bolikhamsay, Khammuan, Savannakhet and Salavan provinces.

The total number count of inventoried *D. cochinchinensis* are 6,697 individual trees.

Table 5 Population of D. cochinchinensis recorded in the field survey

CITES source code / description	Number of inventoried plots/sites/transects in 7 provinces	Number of inventoried trees
Source code W Natural trees in natural forests	109	1.784
Source code A Planted trees	35	2.152
Source code Y Natural trees outside forests	39	2.761
Total individual trees	**183**	**6.697**

D. oliveri were found in eight survey sites across ten villages and 20 survey plots. Most of them were found in Khammuan, Savannakhet, Salavan, Champasack, Attapue and Xekong provinces.

Based on the inventory, the total number of *D. oliveri* recorded were 611 individuals. Among them, 491 individuals (80%) are Source code W, seven individuals are Source code Y and 113 individuals are Source code A. This suggests *D. oliveri* is very rare in plantations and outside natural forests; most are found in natural forests (Table 07).

Table 6 Population of *D. oliveri* recorded in the field survey

CITES source code/description	Number of inventoried plots/sites/transects in 7 provinces	Number of individual trees
Source code W Natural trees in natural forests	10	491
Source code A Planted trees	3	7
Source code Y Natural trees outside forests	7	113
Total individual trees	20	611

In general, the result of the survey shows that *D. cochinchinensis* is widely distributed in the central to southern parts of the country, namely Bolikhamsay, Khammuan, Savannakhet, Salavan, Champasack, and Attapue provinces. On the other hand. D. oliveri is very rare and limited in distribution almost of them were found at Khammuan, Savannakhet, Salavan, Champasack, Xekong and Attapue provinces (Map 09).

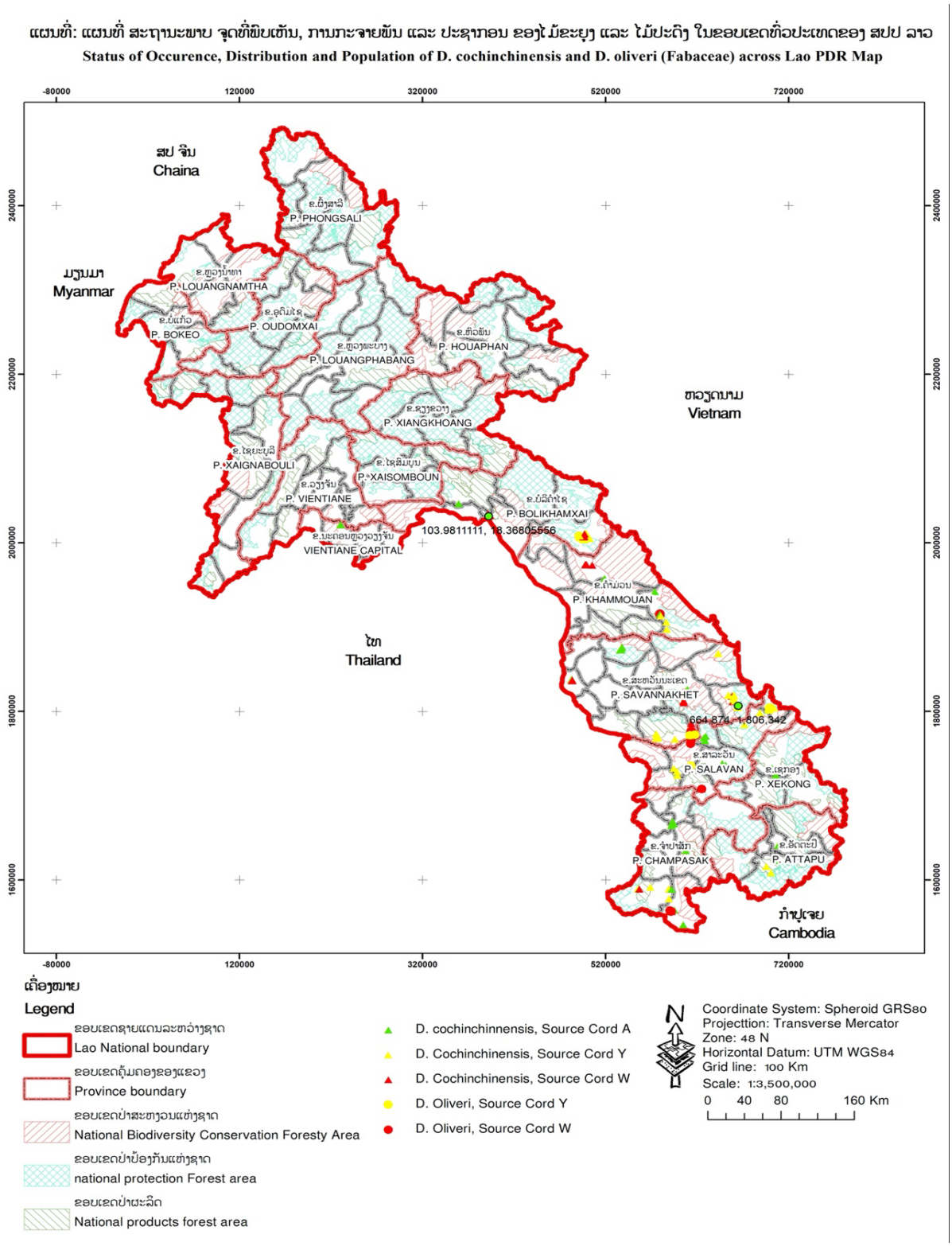

Figure 1 Map 09 Occurrence and distribution map of two Dalbergia species in central and southern Laos

3.2.1 Occurrence and distribution for *D. cochinchinensis* Source code W

Source code W: 1,784 individuals specimens were identified. Of these, mature trees of over DBH 20cm were only 125 trees, which is less than 8%. This indicates a low occurrence of mature trees which is the basis for succession of the species, and therefore represents a high threat to the occurrence of the species.

There is no scientific study done on the threshold population of sustaining *D. cochinchinensis* in a natural habitat. According to the National University of Lao's experience of biological researches and field surveyed by project team, *D. cochinchinensis* can produce seeds when the tree DBH reaches 10 cm. Of the surveyed specimens, DBH over 10 cm accounted for 714 individuals or 66% of the specimen identified under Source Code W.

However, the expert view of the NAFRI study team is that the specimen count is still critically low and conservation and restoration should be prioritized.

3.2.2 Occurrence and distribution for *D. cochinchinensis* Source code A

Source code A (artificially propagated specimens/plantations); 2,152 individuals were identified. Of these, mature trees of over DBH 20 cm were 141 (less than 7%). This indicates a low occurrence of mature trees, which is supported by the fact that only two out of the 20 plantations were planted before 2010, whereas the remaining were planted between 2010 to 2017.

However, during the course of the survey, information sources suggested that there are bigger plantations particularly in Paksong district of Champasak province that amount to as much as 100 ha. This could not be verified through the study due to time limitations.

3.2.3 Occurrence and distribution for *D. cochinchinensis* Source code Y

Source code Y (assisted production outside of forests): 2,761 individuals were identified, of which mature trees of DBH over 6cm were the majority of 2,027 individuals whereas, seedlings represented only 11% and saplings 14%. The low rate of seedlings and saplings are considered to be the result of agriculture and other activities. The regeneration rate of Source code Y is very low, and considered to be at risk of succession. Harvesting of mature trees from Source code Y presents a serious risk.

IV. Discussion and recommendation

4.1.1 Population status

For *D. cochinchinensis*, in the surveyed plots, there were 6.697 trees of all source codes categorized by DBH classes, where the population with the range of DBH between >5 to 10 cm (Grade c) are 2.725 trees or 40,7%, between >10 to 20 (Grade b) are 1.679 trees or 25,1%, and the DBH with size bigger 20 cm (Grade a) are 2.293 trees or 34,2% (table 16).

Table 7 Population of D. cochinchinensis identified through the field plot inventory, by DBH

Source Code	*D. cochinchinensis*			Total
	a	b	c	
W	125	589	1.070	**1.784**
A	141	678	1.333	**2.152**
Y	2.027	412	322	**2.761**
Total	***2.293***	***1.679***	***2.725***	**6.697**
Percentage (%)	***34,2***	***25,1***	***40,7***	***100,0***

For *D. oliveri*, in the surveyed plots, there were 611 trees of all source codes categorized by DBH classes, where the population with the range of DBH between >5 to 10 cm (Grade c) are 368 trees or 60,2%, between >10 to 20 (Grade b) are 90 trees or 14,7%, and the DBH with size bigger 20 cm (Grade a) are 153 trees or 25,0%, please see table 17.

Table 8 Population of D. oliveri identified through the field plot inventory, by DBH

Source Code	*D. oliveri*			Total
	a	b	c	
W	51	79	361	**491**
A	4	1	2	**7**
Y	98	10	5	**113**
Total	***153***	***90***	***368***	**611**
Percentage (%)	***25,0***	***14,7***	***60,2***	***100,0***

Based on the information collected through literature review, interviews, past and present field surveys, the distribution of the two Dalbergia species is limited to the eight provinces in the central and South of the country.

Namely for Source codes W and Y, the population was recorded only in the seven provinces between Bolikhamxay and Attapeu (ie., no Source codes W and Y in Vientiane capital). So far, there is no evidence of Source code W or Y populations outside the seven provinces.

For Source code A, this was recorded in Vientiane capital (see section 3.2.2). Furthermore, annecdotaly it is said that D. cochinchinensis Source code A population exists outside of the eight provinces, however information could not be confirmed.

Based on the results of occurrence and distribution of two Dalbergia survey, the following are discussed and recommend:

4.1.2 Source code W (natural trees occurring in natural forests):

In terms of population of Source code W, the findings of the study are limited to the areas actually inventoried. The general locations of potential occurrence in the eight provinces (within two of these provinces, no source code W is known to exist) are mapped based on information obtained through interviews and literature review. It is noted that this information is based on general knowledge of provincial and district level staff, and research to back this is limited.

The understanding of the NAFRI study team of the results of the survey, is that the population of the two Dalbergia species for Source code W is extremely low.

4.1.3 Source code A (planted):

According to the result of surveyed, we have found Source code A Dalbergia of the two species in 21 villages, 14 districts and 5 provinces. It is considered that *D. cochinchinensis* was intensively planted in Borlikhamsay, Champasack and Attapue provinces, while *D. oliveri* was rarely planted.

According to the recorded data from field survey, estimation of total stand in total inventoried plots (41 ha) by using the simple formulation through survival rate multiplied by the total planted number and devided by 100. The total stand of planted *D. cochinchinensis* are 32,979 individuals (table 15).

In terms of occurrence of Source code A, the findings of this study are limited mostly on information of areas actually inventoried. Based on the information collected from the interviews, it is not possible at this stage to estimate overall volumes of Source code A specimens, or to identify their locations and map these, in most cases. This is due to the way reports are compiled or managed by provincial and district level offices at this point in time.

Until a full registry of tree plantations[1] is enforced throughout the country, estimation of volumes and locations of Source code A specimens will be difficult.

D. oliveri is not found to be planted at this time in the country, due to the limited access to seeds and seedlings.

4.1.4 Source code Y (assisted production):

In terms of occurrence of Source code Y, the findings of this study indicate that occurrence is wide spread across central and southern parts of Lao PDR, and the population is in healthy conditions both in terms of occurrence and growth for *D. cochichinensis*. For *D. oliveri*,

[1] Instruction On the National Registry of the Plantation Forests and Certified Planted Trees No.2492/MAF Vientiane Capital, date 23 December 2020

occurrence as identified through the field study has been limited, and requires more research and inventory to understand its status.

Other discussions

Species identification in the field survey is noted to be a significant challenge, particularly in the distinction between *D. oliveri* and *D. cultrata* which requires careful study of different tree components to accurately identify the species. In this regard, considering the need for futher work in the future to update a Non-Detriment Findings (NDF) for these two species, national capacity to identify these species needs to be strengthened.

Annexes 1 Database

Table 9 Field survey results for D.chochinensis and D. oliveri Source code W (wild)

ID	Plot / Transect	Province	District	Village	Tree count							
					D. cochinchinensis by DBH class			*Total*	*D. oliveri by DBH class*			*Total*
					DBH a	*DBH class b*	*DBH class c*		*DBH a*	*DBH class b*	*DBH class c*	
1	Transect	Khammuan	Nakai	Thalang	5	161	289	**455**	0	0	0	**0**
2	Transect			Khonkhaen	13	194	378	**585**	0	0	0	**0**
3	Transect		Boualapha	Thahae	0	0	0	**0**	12	18	96	**126**
4	Transect	Savannakhet	Kaisone	Thad	37	18	9	**64**	0	0	0	**0**
5	Transect		Nong	Nongvilay	0	0	0	**0**	2	2	0	**4**
6	Transect			Phangdeng	31	47	53	**131**	0	0	0	**0**
7	Transect		Phin	Phin	0	48	11	**59**	0	0	0	**0**
8	Transect	Salavan	LaoNgam	Nabon	0	0	0	**0**	13	25	254	**292**
9	Transect		Ta-Oy	Chohai	5	13	35	**53**	0	0	0	**0**
10	Transect		Toumlan	Samakhixay	0	0	0	**0**	1	1	0	**2**
11	Transect			Boylamuel	0	0	0	**0**	0	4	0	**4**
12	Transect	Champasack	Khong	Donkangkhong	2	31	54	**87**	21	25	0	**46**
13	Transect		Mounlapamok	Nong Nga	4	25	125	**154**	0	0	0	**0**
14	Plot / Transect	Borlikhamsay	Khamkuet	Don Sart	16	21	23	**60**	0	0	0	**0**
15	Plot / Transect			Sop Phuan	12	23	66	**101**	0	0	0	**0**
16	Plot / Transect		Paksan	Phonxay	0	5	27	**32**	0	0	0	**0**
17	Transect	Attapue	Xaysetha	Hatsun	0	3	0	**3**	2	4	11	**17**
Grand total					**125**	**589**	**1.070**	**1.784**	**51**	**79**	**361**	**491**

Table 10 Field survey results for D.chochinensis and D. oliveri Source code A/D (planted)

ID	size (< or > 1 ha)	Province	District	Village	Tree count							Total
					D. cochinchinensis by DBH class			*Total sampling*	*D. oliveri by DBH class*			
					DBH a	*DBH class b*	*DBH class c*		*DBH a*	*DBH class b*	*DBH class c*	
1	<1 ha	Borlikhamsay	Khamkuet	Don Sart	45	85	45	**175**	0	0	0	**0**
2	<1 ha			Sop Phuan	41	123	76	**240**	0	0	0	**0**
3	5 ha	Khammuan	Nakai	Oudomsouk	8	50	102	**160**	0	0	0	**0**
4	<1 ha	Salavan	LaoNgam	Thongko	1	41	33	**75**	0	0	0	**0**
5	<1 ha		Salavan	Nakhok	6	86	38	**130**	0	0	0	**0**
6	<1 ha			Phonephay	1	26	89	**116**	0	0	0	**0**
7	<1 ha		Samuay	Tangko	0	10	18	**28**	0	0	0	**0**
8	<1 ha		Toumlan	Samakhixay	2	0	0	**2**	4	1	2	**7**
9	<1 ha			Porto-oh	3	12	3	**18**	0	0	0	**0**
10	>1 ha		Vapi	Haikham	2	8	110	**120**	0	0	0	**0**
11	<1 ha			Phoumsavan	4	22	1	**27**	0	0	0	**0**
12	3,5 ha	Champasack	Bachieng	Houayduar	0	54	76	**130**	0	0	0	**0**
13	<1 ha		Khong	Sankham	1	0	10	**11**	0	0	0	**0**
14	<1 ha			Thakhor	0	1	10	**11**	0	0	0	**0**
15	2,5 ha		Mounlapamok	Kadan	2	18	99	**119**	0	0	0	**0**
16	1 ha			Vuenkhaen	2	32	44	**78**	0	0	0	**0**
17	4,5 ha		Pakse	Champasack University	7	50	23	**80**	0	0	0	**0**
18	<1 ha		Pathoumphone	Thahou	4	23	2	**29**	0	0	0	**0**
19	8 ha	Attapue	Phouvong	Vangkhaen	12	6	443	**461**	0	0	0	**0**
20	<1 ha		Xaysetha	Hadsaykhao	0	17	25	**42**	0	0	0	**0**
21	8 ha			Xai	0	14	86	**100**	0	0	0	**0**
Grand total					**141**	**678**	**1.333**	**2.152**	**4**	**1**	**2**	**7**

Table 11 Field survey results for D.chochinensis and D. oliveri Source code Y (natural stands occuring outside forests)

ID	NA	Province	District	Village	Tree count							Total
					D. cochinchinensis			Total	*D. oliveri*			
					Seedling	*Sapling*	*Tree*		*Seedling*	*Sapling*	*Tree*	
1	The occurrence of population with distance between tree to tree not exeed 500 m per community/village	Borlikhamsay	Khamkuet	Don Sart	6	12	51	**69**	0	0	0	**0**
2				Sop Phuan	22	17	36	**75**	0	0	2	**2**
3				Nam Di	23	22	96	**141**	0	0	0	**0**
4				Nam Phao	15	24	124	**163**	0	0	0	**0**
5				Lak Sao	23	48	196	**267**	0	0	0	**0**
6			Borlikhan	Sop Suen	102	73	41	**216**	0	0	0	**0**
7		Khammuan	Nakai	Thalang	10	7	3	**20**	0	0	0	**0**
10			Boualapha	Thahae	0	10	0	**10**	5	10	86	**101**
11		Savannakhet	Adsaphone	Songthong	0	12	134	**146**	0	0	0	**0**
12			Nong	Nongvilay	0	0	10	**10**	0	0	0	**0**
13				Patoy	0	0	122	**122**	0	0	0	**0**
14				Sadi	0	0	48	**48**	0	0	0	**0**
15				Tang Alay	0	0	15	**15**	0	0	0	**0**
16			Phin	Phin	0	4	119	**123**	0	0	0	**0**
17		Salavan	Samuay	Lavaitai	0	47	255	**302**	0	0	0	**0**
18				Meokao	24	93	388	**505**	0	0	0	**0**
19				Tangko	13	14	128	**155**	0	0	0	**0**
20			Ta-Oy	Chohai	0	0	13	**13**	0	0	0	**0**
21				Houp	0	7	100	**107**	0	0	0	**0**
22			Toumlan	Samakhixay	8	8	12	**28**	0	0	0	**0**
23			Vapi	Donekham	0	0	0	**0**	0	0	5	**5**

ID	NA	Province	District	Village	Tree count							Total
					D. cochinchinensis			Total	*D. oliveri*			
					Seedling	*Sapling*	*Tree*		*Seedling*	*Sapling*	*Tree*	
24		Champasack	Mounlapamok	Kadan	0	0	33	**33**	0	0	0	**0**
25				Saphang	0	0	3	**3**	0	0	0	**0**
26		Attapue	Phouvong	Vongsomphou	76	14	100	**190**	0	0	0	**0**
27		Xekong	Lamam	Nongbong	0	0	0	**0**	0	0	5	**5**
Grand total					**322**	**412**	**2.027**	**2.761**	**5**	**10**	**98**	**113**

Table 12 *Plantation status of D. cochinchinensis in central to southern Laos*

ID	Province	District	Village	Planted Year	Area (ha)	Spacing	Sampling Number	Mean of DBH	STDEV	Total of No. Planted	Survival rate (%)	Estimated total No. of stand
1	Borlikhamsay	Khamkuet	Don Sart	2007	1,5	3 m x 3 m	*175*	7,6	±2,5	1.667	90	1.500
2			Sop Phuan	NA	2,5	3 m x 3 m	*240*	12,4	±5,8	2.778	90	2.500
3	Khammuan	Nakai	Oudomsouk	2005	5	3 m x 3 m	*160*	10,3	±6,0	5.556	80	4.444
4	Salavan	LaoNgam	Thongko	NA	0,5	3 m x 3 m	*75*	12,3	±4,5	75	75	75
5		Salavan	Nakhok	2010	1,3	3 m x 3 m	*130*	12,1	±3,9	1.444	80	1.156
6			Phonephay	2012	1,2	3 m x 3 m	*116*	7,4	±4,0	1.333	80	1.067
7		Samuay	Tangko	2012	0,3	3 m x 3 m	*28*	8,5	±4,2	28	50	28
8		Toumlan	Samakhixay	2013	0,001	3 m x 3 m	*2*	29	±1	2	50	2
9			Porto-oh	NA	0,1	3 m x 3 m	*18*	7,2	±2,7	18	50	18
10		Vapi	Haikham	NA	1,2	3 m x 3 m	*120*	7,0	±5,0	1.333	85	1.133
11			Phoumsavan	NA	0,1	3 m x 3 m	*27*	10,8	±3,1	27	50	27
12	Champasack	Bachieng	Houayduar	2015	3,5	3 m x 3 m	*130*	16,9	±9,8	3.889	85	3.306
13		Khong	Sankham	2016	0,1	3 m x 3 m	*11*	8,8	±4,1	11	50	11
14			Thakhor	2016	0,1	3 m x 3 m	*11*	11	±0,1	11	50	11
15		Mounlapamok	Kadan	2016	2,5	3 m x 3 m	*119*	8,1	±5,1	2.778	85	2.361

16			Vuenkhaen	2013	0,2	3 m x 3 m	*78*	12,3	±5,8	78	60	78
17		Pakse	Champasack University	2004	4,5	3 m x 3 m	*80*	15,1	±5,1	80	70	80
18		Pathoumphone	Thahou	2014	0,1	3 m x 3 m	*29*	13,6	±6,1	29	50	29
19	Attapue	Phouvong	Vangkhaen	2020	8	3 m x 3 m	*461*	4,9	±2,0	8.889	90	8.000
20		Xaysetha	Hadsaykhao	2017	0,1	3 m x 3 m	*42*	6,0	±4,5	42	50	42
21			Xai	2017	8	3 m x 3 m	*100*	7,7	±2,6	8.889	80	7.111
Grand total					**41**		***2.152***			**38.957**		**32.979**

Notice: NA = data not available; Total Planted = (10.000/9) x Area; Estimated total No. of stand = (Survival rate x Total Planted)/100

Annex 2 Location of field inventory plots surveyed by province

Table 13 Location of field inventory plots surveyed by province

Province name	District name	Village name	Plots point		
			N	E	Elv.
Vientiane CP	Naxaithong District	Phonethong			
Bolikhamxay	Khamkeauth	Bane Nam di	18° 07' 48.7"	105° 01' 22.2"	518
			18° 07' 48.7"	105° 01' 24.5"	515
			18° 07' 47.1"	105° 01' 24.2"	514
		Bane Nam phao	18° 08' 17.5"	105° 01' 29.1"	529
			18° 10' 21.3"	104° 59' 43.2"	524
			18° 10' 48.8"	104° 59' 04.3"	533
			18° 10' 49.5"	104° 59' 05.4"	534
		Don sad	18° 09' 51.8"	104° 55' 22.3"	506
			18° 09' 33.3"	104° 55' 16.3"	522
			18° 09' 38.7"	104° 55' 11.3"	520
			18° 09' 58.1"	104° 55' 16.0"	524
			18° 08' 54.1"	104° 55' 46.0"	525
			18° 08' 52.6"	104° 55' 44.8"	524
			18° 08' 50.6"	104° 55' 44.6"	528
			18° 08' 50.1"	104° 55' 43.8"	532
			18° 09' 09.0"	104° 55' 29.5"	518
			18° 09' 17.1"	104° 55' 04.9"	524
		Lacsao	18° 11' 05.2"	104° 58' 50.5"	533
			18° 10' 58.6"	104° 58' 48.9"	531
			18° 11' 10.0"	104° 58' 56.0"	531
			18° 11' 12.2"	104° 58' 54.7"	529
			18° 11' 07.9"	104° 59' 38.2"	524
			18° 11' 29.9"	104° 58' 41.9"	522
		Sop phouane	18° 11' 10.0"	104° 58' 56.0"	531
			18° 09' 00.5"	104° 57' 52.9"	527
			18° 09' 03.0"	104° 57' 53.7"	520
			18° 09' 05.9"	104° 57' 56.4"	516
			18° 07' 42.5"	104° 57' 47.2"	510
			18° 09' 05.4"	104° 57' 55.4"	516
			18° 06' 56.6"	104° 58' 10.5"	504
			18° 11' 29.9"	104° 58' 41.9"	522
			18° 11' 30.4"	104° 58' 40.5"	530
			18° 07' 42.5"	104° 57' 47.2"	510
			18° 10' 58.6"	104° 58' 48.9"	531
			18° 11' 12.2"	104° 58' 54.7"	529
			18° 08' 06.6"	104° 57' 28.2"	506
	Bolikhanxai	Bane sopseun	18° 30' 04.8"	103° 40' 15.2"	179
	Paksan	Phonxai	18° 19' 18.5"	103° 50' 53.2"	188
			18° 19' 28.2"	103° 50' 51.3"	202

Khammuane	Nakai	Bane Thalang	17° 50' 44.7"	105° 03' 07.6"	517
			17° 50' 59.9"	104° 59' 41.8"	531
			17° 51' 00.1"	104° 59' 31.1"	561
			17° 50' 58.3"	104° 59' 23.7"	569
			17° 50' 59.2"	104° 59' 15.3"	572
			17° 50' 59.8"	104° 59' 12.6"	575
			17° 50' 57.9"	104° 59' 05.9"	579
			17° 50' 59.5"	104° 59' 02.1"	577
			17° 51' 04.1"	104° 58' 59.7"	575
			17° 51' 05.8"	104° 58' 56.6"	573
			17° 51' 08.8"	104° 58' 55.2"	571
			17° 51' 13.1"	104° 58' 53.3"	567
			17° 51' 09.2"	104° 58' 58.6"	571
			17° 51' 04.4"	104° 59' 05.4"	576
			17° 51' 07.2"	104° 59' 08.8"	571
			17° 51' 03.9"	104° 59' 09.5"	574
			17° 19' 01.0"	105° 44' 54.7"	197
		Bane Thahae	17° 19' 01.0"	105° 44' 54.7"	197
			17° 18' 20.4"	105° 44' 51.3"	191
			17° 19' 20.3"	105° 44' 45.6"	249
			17° 19' 22.8"	105° 44' 46.0"	269
			17° 19' 24.1"	105° 44' 49.3"	278
			17° 19' 28.2"	105° 44' 52.7"	311
			17° 19' 32.9"	105° 44' 52.6"	334
			17° 19' 19.7"	105° 44' 52.7"	253
			17° 19' 17.1"	105° 44' 54.2"	232
		Bane Oudomsouk	17° 42' 06.0"	105° 10' 44.4"	547
			17° 42' 07.5"	105° 10' 43.7"	545
			17° 42' 05.7"	105° 10' 48.2"	547
			17° 42' 05.9"	105° 10' 47.1"	548
			17° 42' 03.5"	105° 10' 46.3"	549
			17° 42' 03.8"	105° 10' 47.9"	548
			17° 42' 04.6"	105° 10' 46.6"	549
		Bane Khonkhaen	17° 38' 09.4"	105° 18' 53.1"	560
			17° 38' 19.3"	105° 17' 56.7"	561
			17° 38' 12.4"	105° 17' 52.7"	558
			17° 38' 14.0"	105° 17' 56.8"	558
			17° 38' 10.5"	105° 17' 51.9"	561
			17° 37' 05.1"	105° 22' 00.5"	562
			17° 37' 05.5"	105° 22' 02.9"	567
			17° 37' 04.8"	105° 22' 07.1"	573
			17° 37' 05.7"	105° 22' 07.5"	574
	Boualapha	Bane Khonkhaen	17° 38' 02.4"	105° 21' 29.9"	553
Savannakhet	Adsaphone	Bane Songhong	16° 56' 12.0"	105° 20' 35.0"	148
			16° 56' 21.7"	105° 20' 34.3"	175
			16° 56' 21.8"	105° 20' 29.9"	185

			16° 56' 15.5"	105° 20' 29.5"	183
			16° 57' 57.5"	105° 21' 27.0"	215
			16° 58' 04.8"	105° 21' 29.2"	213
			16° 57' 53.7"	105° 21' 32.5"	221
			16° 57' 53.1"	105° 21' 31.2"	206
			16° 57' 04.1"	105° 21' 08.4"	206
			16° 56' 19.1"	105° 20' 42.3"	185
			16° 56' 11.3"	105° 20' 40.7"	189
	Kaisone	Bane Thad	16° 36' 36.1"	104° 50' 50.0"	155
			16° 36' 34.1"	104° 50' 54.9	149
			16° 36' 37.0"	104° 50' 46.6"	153
			16° 36' 56.8"	104° 50' 40.8"	156
			16° 36' 59.6"	104° 50' 41.5"	159
			16° 37' 03.9"	104° 50' 39.6"	161
			16° 37' 09.8"	104° 50' 38.9"	163
			16° 37' 19.9"	104° 50' 38.5"	167
	Nong	Bane Phangdeng	16° 26' 02.9"	106° 28' 55.5"	364
			16° 26' 01.6"	106° 28' 55.1"	364
			16° 26' 05.6"	106° 28' 56.3"	367
		Bane Pa toy	16° 18' 45.2"	106° 32' 27.9"	281
			16° 18' 42.2"	106° 32' 27.7"	309
			16° 18' 51.2"	106° 32' 31.5"	306
			16° 19' 57.3"	106° 32' 36.3"	318
			16° 19' 56.8"	106° 32' 33.8"	297
			16° 20' 50.1"	106° 32' 26.6"	298
			16° 23' 07.5"	106° 30' 51.4"	283
			16° 23' 06.3"	106° 30' 49.3"	286
			16° 23' 06.6"	106° 30' 48.1"	286
		Bane thong ah lai	16° 20' 18.7"	106° 32' 37.5"	281
		BaneNongvilai	16° 22' 40.5"	106° 29' 51.4"	292
		Bane nong	16° 22' 45.9"	106° 29' 26.8"	272
		Bane sadi	16° 26' 21.1"	106° 29' 05.5"	353
			16° 26' 28.5"	106° 30' 15.8"	315
			16° 26' 24.6"	106° 30' 09.9"	324
			16° 26' 22.8"	106° 30' 12.7"	326
	Phin	Bane Vonglakhone	16° 23' 11.7"	105° 59' 08.2"	276
			16° 23' 05.0"	105° 59' 13.6"	278
			16° 23' 07.2"	105° 59' 18.7"	277
			16° 23' 01.1"	105° 59' 18.8"	274
			16° 23' 02.5"	105° 59' 16.7"	277
		Bane Phin	16° 30' 31.4"	106° 01' 35.9"	206
			16° 30' 31.5"	106° 01' 38.0"	199
			16° 30' 29.7"	106° 01' 39.2"	199
			16° 30' 29.3	106° 01' 37.6"	200
			16° 30' 27.3"	106° 01' 36.0"	200
			16° 30' 27.2"	106° 01' 33.4"	203

			16° 30' 30.4"	106° 01' 33.2"	206
Salavan	LaoNgam	Thongko	15°26'37.0"	106°09'58.7"	574
			15°27'24.7"	106°10'22.0"	567
		Nabon	15°31'23.3"	106°07'57.9"	390
	Salavan	Nakhok	15°41'44.6"	106°24'28.8"	
			15°41'45.1"	106°244'4.01"	
		Phonephay	15°42'56.4"	106°22'38.6"	
	Samouay	Lavatai	16°17'50.4"	106°52'05.9"	576
			16°18'25.7"	106°52'06.1"	
		Tangko	16°18'18.0"	106°54'44.9"	586
			16°18'12.5"	106°54'41.1"	
		Neokao	16°17'49.0"	106°51'21.9"	
			17°11'30.0"	106°51'29.0"	
			16°17'18.0"	106°51'45.0"	
			16°17'20.0"	106°51'38.6"	
			16°17'14.0"	106°51'40.0"	
			16°17'14.0"	106°51'48.0"	
			16°17'19.9"	106°51'37.5"	
			16°17'18.0"	106°51'39.8"	602
			16°17'16.8"	106°51'34.1"	
			16°17'14.0"	106°51'54.0"	
			16°16'52.0"	106°51'32.4"	
			16°17'16.4"	106°58'04.8"	
	Ta-Oy	Chohai	16°15'20.2"	106°46'07.2"	400
		Houp			
	Toumlan	Samakhixay	16°00'48.1"	106°12'41.3"	183
			16°00'29.1"	106°12'39.3"	
		Borlamuel	15°59'35.1"	106°11'30.5"	158
		Portor-Oh	15°57'33.8"	106°12'25.4"	195
	Vapy	Haikham	15°39'50.8"	105°53'04.5"	143
		Donekham	15°35'18.9"	105°55'18.9"	188
		Phoumsavan	15°41'38.9"	106°03'29.6"	180
Champasak	Bachieng	Houayduar	15°03'08.1"	105°51'24.9"	
	Khong	Donkangkhong	15°91'95.9"	105°62'46.9"	79
			15°91'86.7"	105°62'49.1"	115
			14°82'04.0"	105°31'09.0"	140
			15°90'87.5"	15°63'42.5"	145
			14°07'55.0"	105°51'07.0"	100
		Sankham	14°08'77.8"	105°52'52.56"	
	Mounlapamok	Kalan	14°22'16.6"	105°31'43.1"	104
			14°88'17.1"	105°30'58.0"	400
			14°23'21.1"	105°38'27.2"	118
		Nongnga	14°22'12.9"	105°32'21.2"	106
			14°22'12.0"	105°32'21.0"	130
		Vuenkhaen	14°22'09.9"	105°49'44.6"	
	Pakse	Ban Chadsan	15°05'40.2"	105°52'07.9"	191

	Pathoumphone	Thahou	14°46·53.8"	105°00·02.4"	150
Attapue	Phouvong	Vangsomphou	14°36·17.0"	106°49·14.0"	230
		Vangkhaen	14°41·13.0"	106°53·57.0"	120
			14°04·09.0"	106°54·40.0"	210
			14°32·15.0"	106°52·10.0"	440
	Xaysettha	Hatsun	14°79·63.0"	107°16·09.1"	108
			14°47·57.0"	107°09·42.0"	170
		Hartsaykhao	14°49·01.0"	106°57·45.0"	90
			14°49·02.0"	106°56·40.0"	160
		Say	14°49·52.9"	106°56·28.4"	105

Annex 3 List of supported documents from PAFOs and DAFOs in 6 provinces (will be added later, need to scanned)

1) Brief report of forest plantation in Xepangfai district, Khammouan province.
2) Brief report of forest plantation in Borlikhamsay province
3) List of Dalbergia tree species in Nong and Thapangthong districts, Savannaket province
4) List of Dalbergia tree species in Khong district, Champasack province
5) List of restoration forest area in National Production Forest, Attapue province, 2018.
6) List of restoration forest area in National Protected Area, Attapue province, 2018.
7) List of restoration forest area in National Protection Forest, Attapue province, 2018.
8) List of small holder plantations of Dalbergia cochionchinensis in Savannakhet province.
9) Official letter to report the status of Dalbergia tree species in Savannaket province, 2022.
10) Report of tree planting for restoration in Namkong1 Hydropower development area, Attapue province 2021.Summary of seed collection, seedling production and tree planting approach in Attapue province, 2017-2019.
11) Summary of tree planting in Attapue province, 2018.
12) Summary of tree plantation in Borlikhamsay province, 2022.
13) Summary of tree plantation in Khammouan province, 2022
14) Summary of tree plantation in Savannakhet province, 2022

Annex 4 Occurrence and distribution of two Dalbergia species in each province

Bolikhamxai province

In Bolikhamxai province a total of 1,541 records, there are 1,539 individual records of *D. cochinchinensis* and only two individuals of *D. oliveri* (Table 8, Map 02).

Table 14 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Bolikhamxai province

CITES source code / description	**Total of the 2 Dalbergia species in province**	***D. cochinchinensis***		***D. oliveri***	
		Number of individual trees	Percentage of total number of the 2 Dalbergia species trees that were recorded in the province (%)	Number of individual trees	Percentage of total number of the 2 Dalbergia species trees that were recorded in the province (%)
Source code W Natural trees in natural forests	193	193	13,52	0	0,00
Source code Y Natural trees outside forests	933	931	57,25	2	0,14
Source code A Planted trees	415	415	29,08	0	0,00
Total tree	1.541	1.539	99,9	2	0,1

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Map 02):

- Source Code W and Y: there are 193 individuals of source cord W and 931 individuals of source cord Y for *D. cochinchinesis*. While, *D. oliveri* was found only 2 individuals of source cord Y. All of them found in Sop-Suen village in Bolikhan district, Don-Sat, Sop-Phuan, Laksao, Nam di, and Nam-Phaovillages. All of those located in Khamkhuet district.
- Source Code A: there were 415 individuals for *D. cochinchinesis* found in Don-Sat and Sop-Phuan villages, both in Khamkuet district.

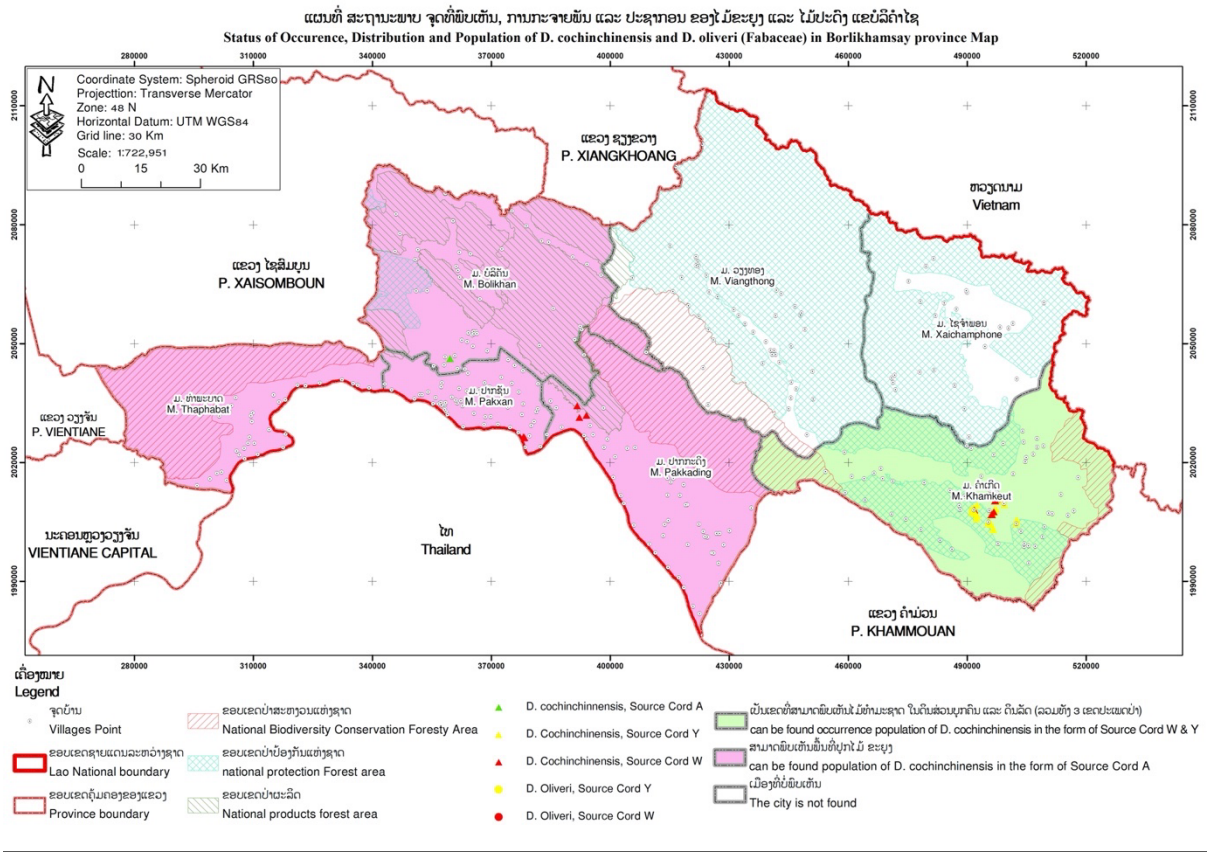

Figure 2 Map 2 Occurrence and distribution map of two Dalbergia species at Bolikhamxai province

Khammouane province

In Khammopuane province a total of 1,296 records, among them 1,210 individuals (93%) of *D. cochinchinensis* and 86 individuals of *D. oliveri* were recorded (Table 09).

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Map 03):

- *D. cochinchinensis* Source code W: 1,040 at Thalang and Khonkhaen villages, Nakai district
- *D. cochinchinensis* Source code Y: 30 in Thalang village, Boualapha district
- *D. cochinchinensis* Source code A: 160 individuals in Oudomsouk village, Nakai district
- *D. oliveri* Source code W: 126 individuals in Thahae village, Bualapha district and 101 individuals of Source Cord Y in Thahae village, Bualapha district.

Table 15 Population of *D. cochinchinensis* and *D. oliveri* identified through field survey inventory in Khammouane province

CITES source code / description	Total of Records in province	*D. cochinchinensis*		*D. oliveri*	
		Number of individual trees	Percentage of total trees that were recorded in the province	Number of individual trees	Percentage of total trees that were recorded in the province
Source code W Natural trees in natural forests	1.166	1.040	85	126	56
Source code Y Natural trees outside forests	131	30	2	101	44
Source code A Planted trees	160	160	13	0	0

Total tree	1.457	1.230	84,4	227	15,6

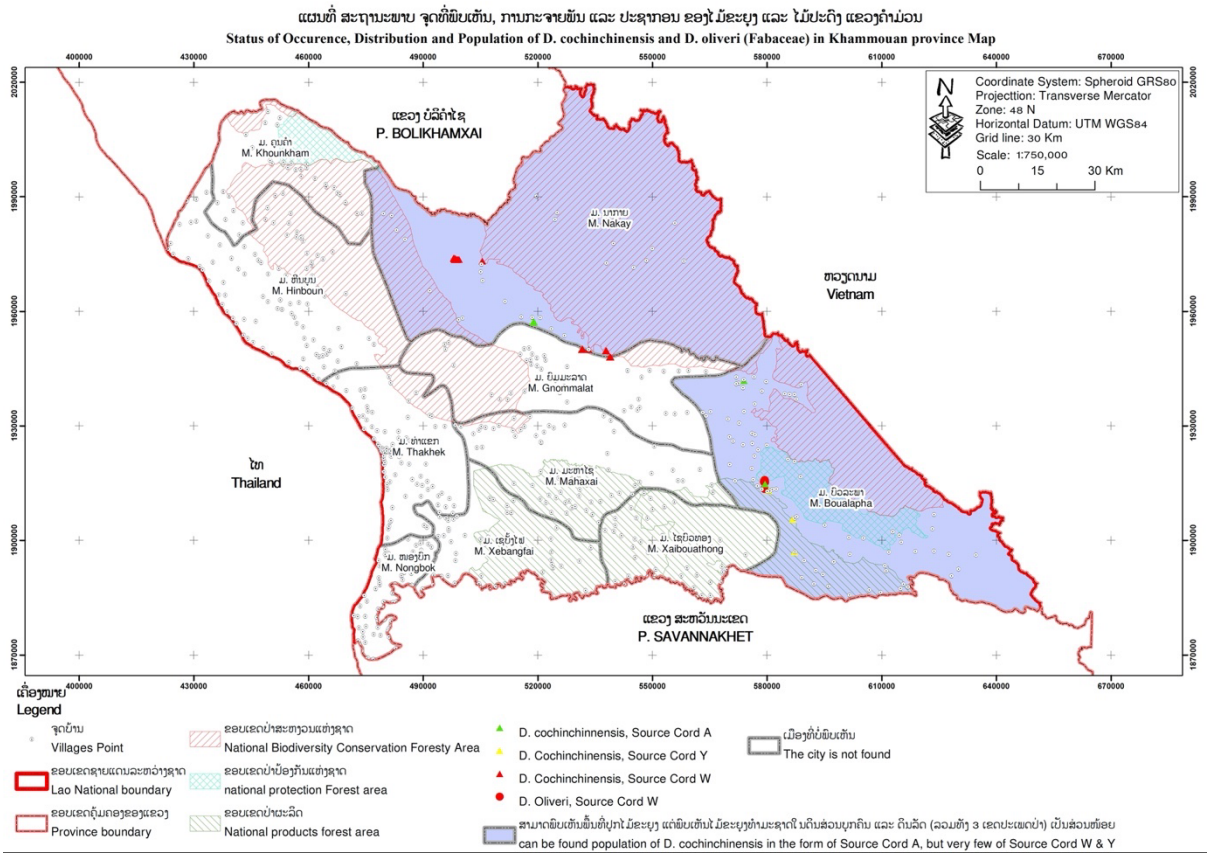

Figure 3 Map 03 Occurrence and distribution map of two Dalbergia species at Khammouane province

Savannakhet province

In Savannakhet province a total of 722 records, including 718 individuals (99,4%) of *D. cochinchinensis* and four individuals of *D. oliveri* were recorded. This result indicate *D. oliveri* is very rare in Savannakheth province.

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Table 09, Map 04):

- *D. cochinchinensis* Source code W: 254 individuals in Thad village, Kaisone district, Phangdeng village in Nong district, Phin village in Phin district.
- *D. cochinchinensis* Source code Y: 464 individuals, of which, 146 individuals in Songthong village, Atsaphone district, 195 individuals in Nongvilay, Patoy, Sadi, and Tang-Alay villages in Nong district, and 123 individuals in Phin village, Phing district. While no Source code A were recorded.
- *D. oliveri* Source code W: four individuals in Thad village, Kaisone district

Table 16 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Savannakhet province

CITES source code / description	Total of Records in province	*D. cochinchinensis*		*D. oliveri*	
		Number of individual trees	Percentage of total trees that were recorded in the province	Number of individual trees	Percentage of total trees that were recorded in the province

Source code W Natural trees in natural forests	258	254	35,	4	100
Source code Y Natural trees outside forests	464	464	65	0	0,00
Source code A Planted trees	0	0	0,00	0	0,00
Total tree	722	718	99,4	4	0,6

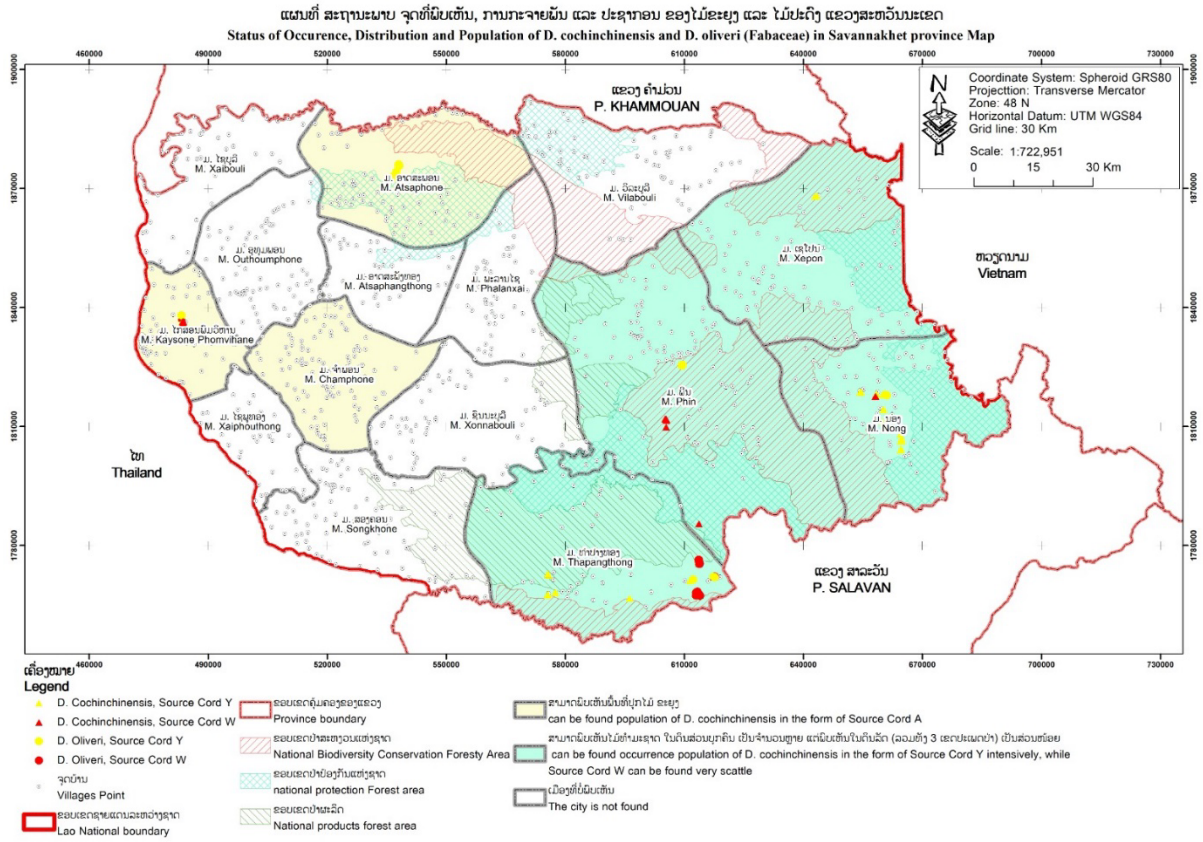

Figure 4 Map 04 Occurrence and distribution map of two *Dalbergia* species at Savannakhet province:

Salavanh province

In Salavanh province a total of 1,989 records, among them 1,679 individuals (96%)of *D. cochinchinensis* and 310 individuals of *D. oliveri* were recorded.

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Table 11 and Map 05):

- Source code W: *D. Cochinchinensis* were found 53 individuals in Chohai village, Ta-Oy district, while *D. oliveri* were found 298 individuals in Nabon village, LaoNgam district.
- Source code Y: *D. cochinchinensis* were found 1.110 individuals in Lavatai, Meokao and Tangko villages, Samuay district, Chohai & Houp villages, Ta-Oy district, Samakhixay village, Toumlan district, and Donekham village, Vapi district. While, *D. oliveri* were found 5 individuals in Donekham village, Vapi district.
- Source code A: *D. cochinchinensis* were found with 516 individuals in Thongko village, LaoNgam district, Nakhok & Phonephay villages, Toumlan district, and Haikham & Phoumsavan villages,

Vapi district. While, D. oliveri were found with seven individuals in Samakhixay village, Toumlan district.

-

Table 17 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Salavanh province

CITES source code / description	Total of Records in province	*D. cochinchinensis*		*D. oliveri*	
		Number of individual trees	Percentage of total trees that were recorded in the province	Number of individual trees	Percentage of total trees that were recorded in the province
Source code W Natural trees in natural forests	351	53	3	298	96
Source code Y Natural trees outside forests	1.115	1.110	66	5	2
Source code A Planted trees	525	516	31	7	2
Total tree	1.989	1.679	84,4	310	15,6

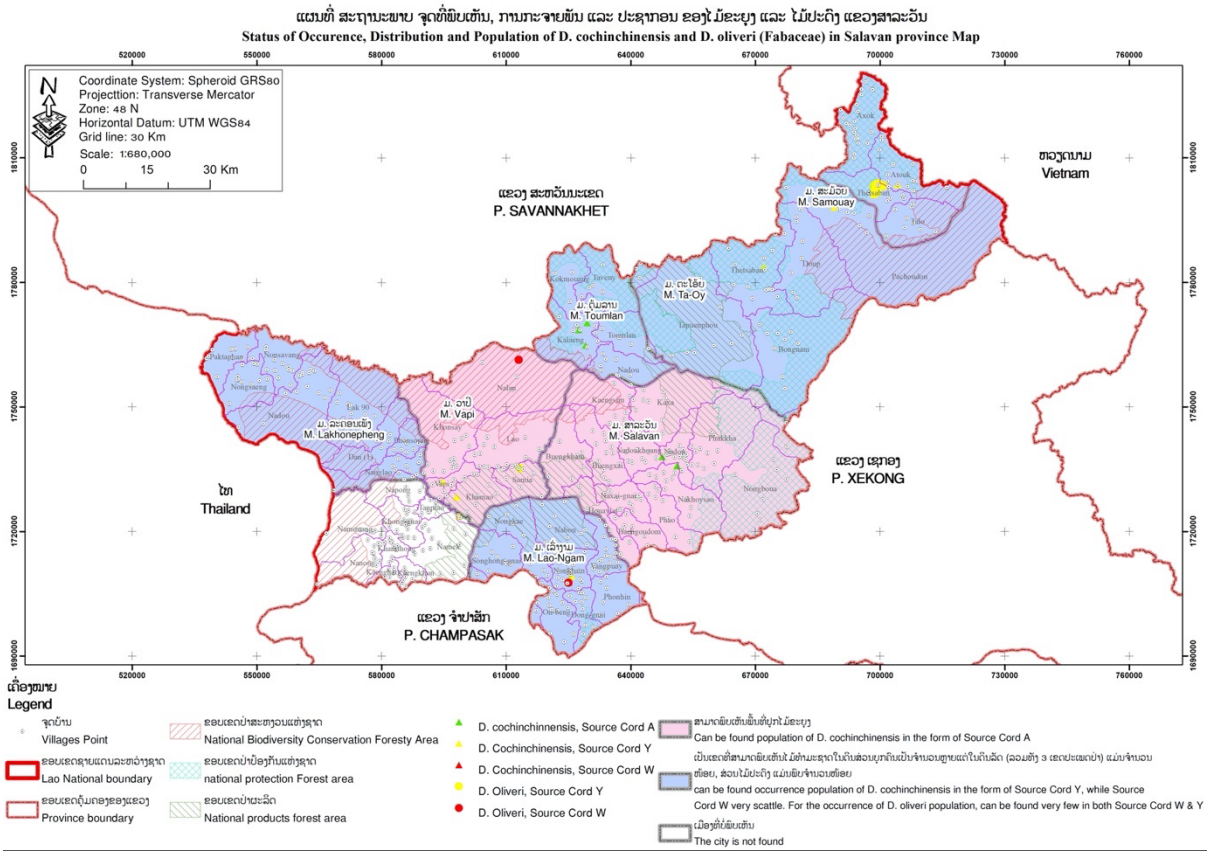

Figure 5 ***Map 05: Occurrence and distribution map of two Dalbergia species at Salavanh province****:*

Champasack Province

In Champasack Province through the field inventory, a total of 781 trees of the two Dalbergia species were identified including 735 individuals of *D. cochinchinensis* and 46 individuals of *D. oliveri*.

According to the current unofficial report by local forestry staff that Dalbergia Sp. There are scattered occurrences of this species on the slopes of the Annamite Range, borders between Laos, Vietnam, and Cambodia, which is located in the remaining Intact Forest Landscapes (IFLs) in Laos. These species hold globally significant biodiversity and at the time of the report writing, as a signatory to the CBD, the GoL prepared the project proposal which has been recently approved by CBD secretariat to increase protection of 100% of the IFLs in Lao PDR, with co-benefits of protecting globally significant biodiversity including Dalbergia Sp. To date, no research on Dalbergia Sp. in the IFLs in Laos has been undertaken to understand the status of population where it needs to conduct thorough inventories of species as occurrence, distribution and population status of species because these IFLs are very difficult to access with no road and far away from the city. So, it is important that the future study should be undertaken in this area.

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Table 12, Map 06):

- Source code W: *D. cochinchinensis* were found with 241 individuals in Donkangkhong village, Kohong district and Nong-Nga village (national production forest) inMounlapamok district. While, *D. oliveri* were found with 46 individuals in Donkangkhong village, Khong district.
- Source Code Y: *D. cochinchinensis* were found with 36 individuals in Kadan & Saphang villages, Mounlapamok district. While, *D. oliveri* were absent for this source cord.
- Source Code A: *D. cochinchinensis* were found with 458 individuals in Thakhor & Sankham villages in Kong district, Houayduar village in Bachiang district and Vuenkhaen & Kadan villages in Mounlapamok district. Champasack University, Pakse district. While *D. oliveri* was absent for this source cord.

Table 18 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Champasack province

CITES source code / description	Total of Records in province	*D. cochinchinensis*		*D. oliveri*	
		Number of individual trees	Percentage of total trees that were recorded in the province	Number of individual trees	Percentage of total trees that were recorded in the province
Source code W Natural trees in natural forests	735	241	33	46	100
Source code Y Natural trees outside forests	46	36	5	0	0,00
Source code A Planted trees	448	458	62	0	0,00
Total tree	781	735	94,1	46	5,9

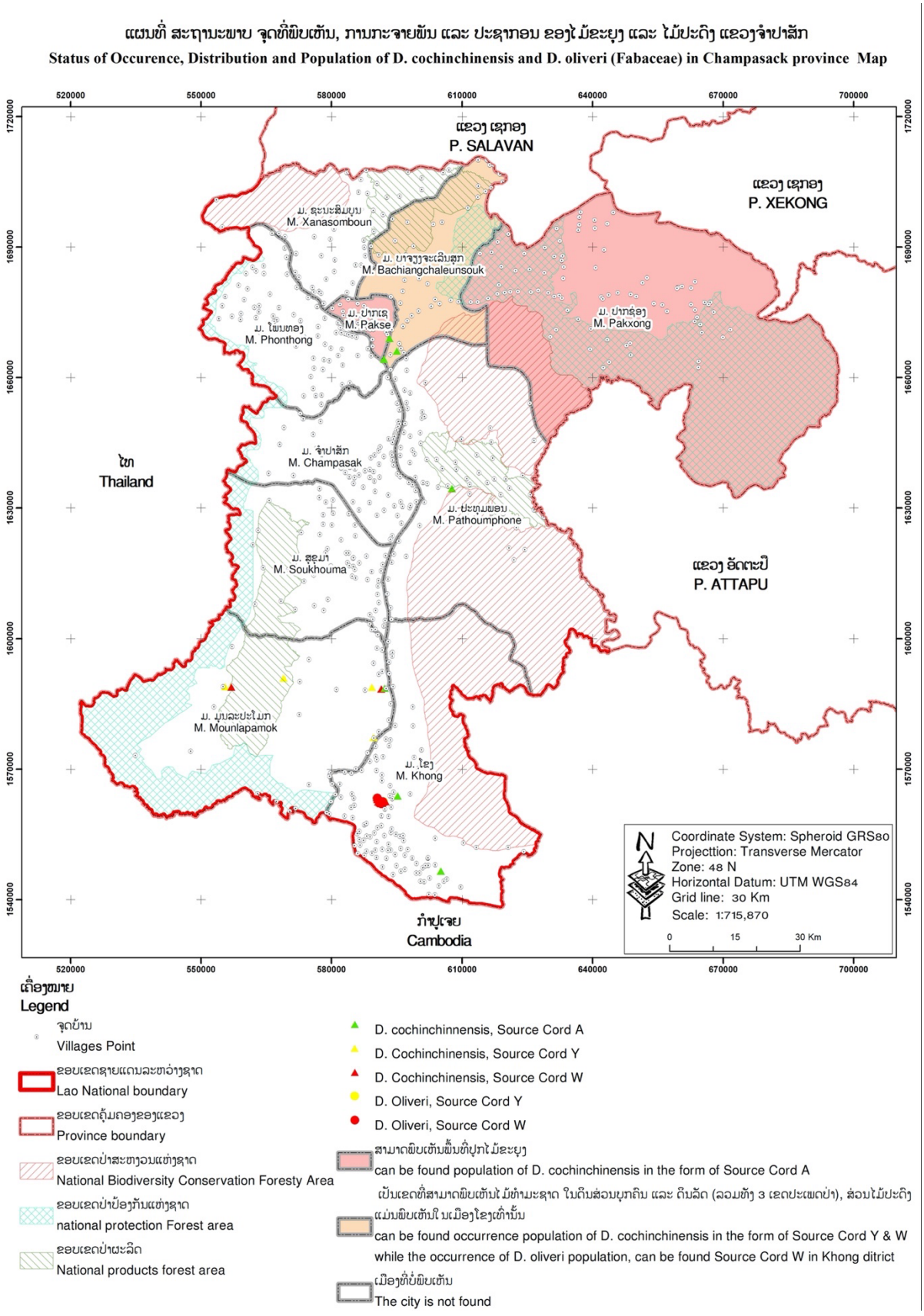

Figure 6 Map 06: Occurrence and distribution map of two Dalbergia species at Champasack province

Attapue province

In Attapeu province a total of 813 records, there are 796 (97.9%) individuals of D. cochinchinensis and 17 individuals (2.1%) of D. oliveri trees were found.

Locations of occurrence of *D. cochinchinensis* and *D. oliveri* are (Table 13 and Map 07):

- Source code W: *D. cochinchinensis* were found with three individuals and *D. oliveri* were found with 17 individuals in Hatsun village, Xaysetha district.
- Source code Y: *D. cochinchinensis* were found with 190 wild individuals in Vongsomphou village, Phouvong district. While D. oliveri was absent for this source cord.
- Source code A: *D. cochinchinensis* were found with 603 individuals in Hadsaykhao & Xai villages, Saysetha district, and Vangkhaen village, Phouvong district. While D. oliveri was absent for this source cord.

Table 19 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Attapue province

CITES source code / description	Total of Records in province	*D. cochinchinensis*		*D. oliveri*	
		Number of individual trees	Percentage of total trees that were recorded in the province	Number of individual trees	Percentage of total trees that were recorded in the province
Source code W Natural trees in natural forests	20	3	0,4	17	100
Source code Y Natural trees outside forests	190	190	75,8	0	0,00
Source code A Planted trees	603	603	23,9	0	0,00
Total tree	813	796	97,9	17	2,1

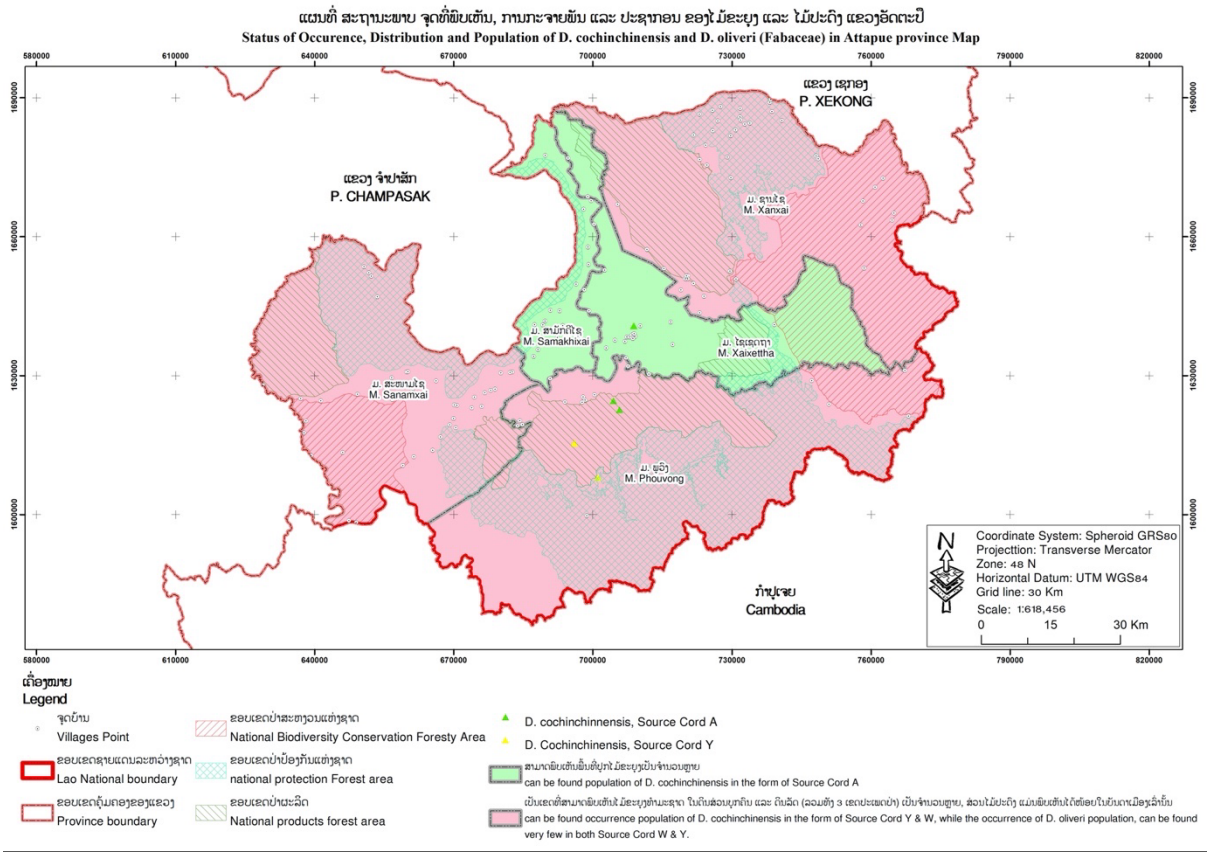

Figure 7 Map 07: Occurrence and distribution map of two Dalbergia species at Attapue province

Vientiane capital:

Previous field studies undertaken have identified that, in Vientiane capital, two sites of Source code A *D. cochinchinensis* were identified, while *D. Oliveri* was not found (Map 01). These two sites are the research oriendted plantations sites under the Forest Research Center of NAFRI intended for genetic resources conservation and the Faculty of Forest Science, National University of Lao PDR's demonstration forest area in Sangthong district. There is research data from Forest Reseaerch Center on Tree Seed Source Assessment, 2017, so these plantations were not subject to inventory under this study. The results of the past research were used for the study.

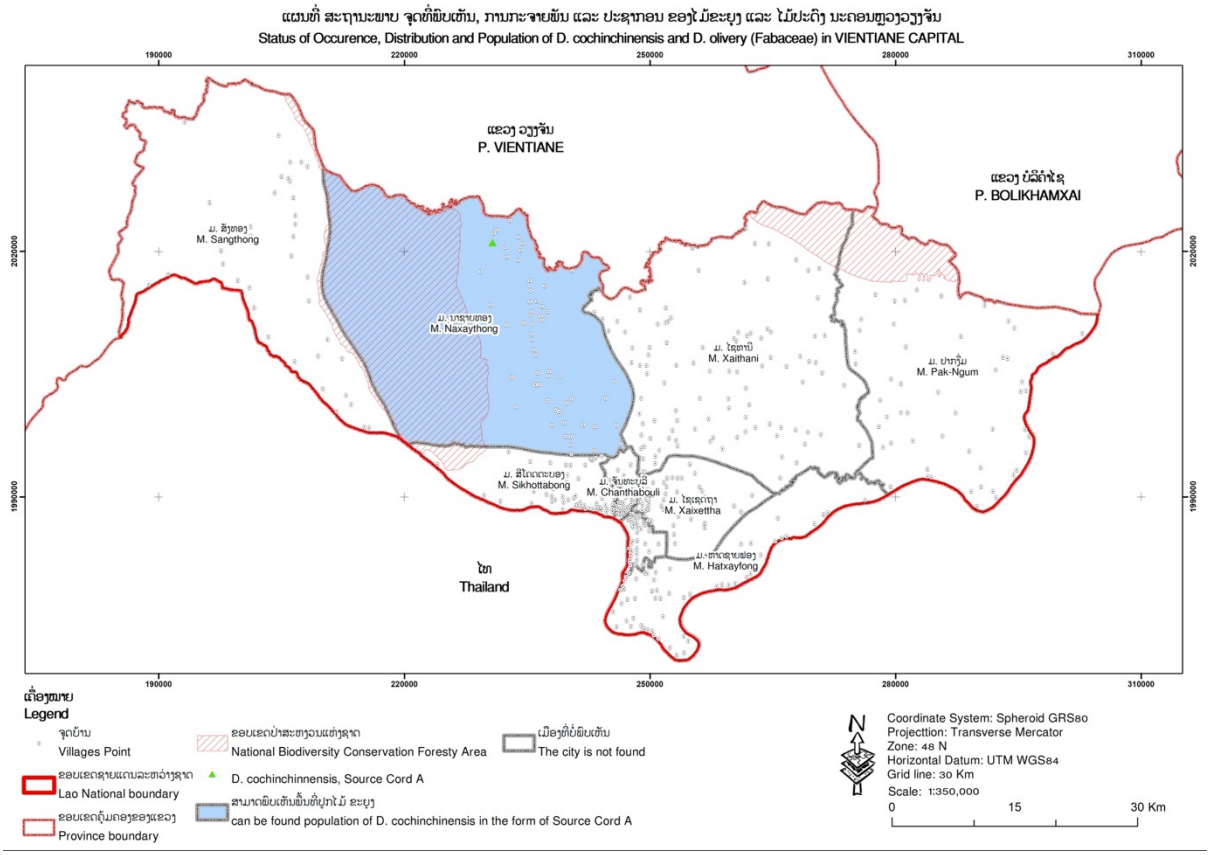

Figure 8 Map 01. Occurrence and distribution status of D. cochinchinensis and D. oliveri at Vientiane capital

Xekong province

Previous field studies undertaken have identified that, in Sekong province only five *D. oliveri* of Source code Y were identified and no *D. cochinchinensis* were recorded.

Locations of occurrence of and *D. oliveri* are (Table 14 and Map 08):

- *D. oliveri* Source code Y: five individuals in Nongbong village, Lamam district

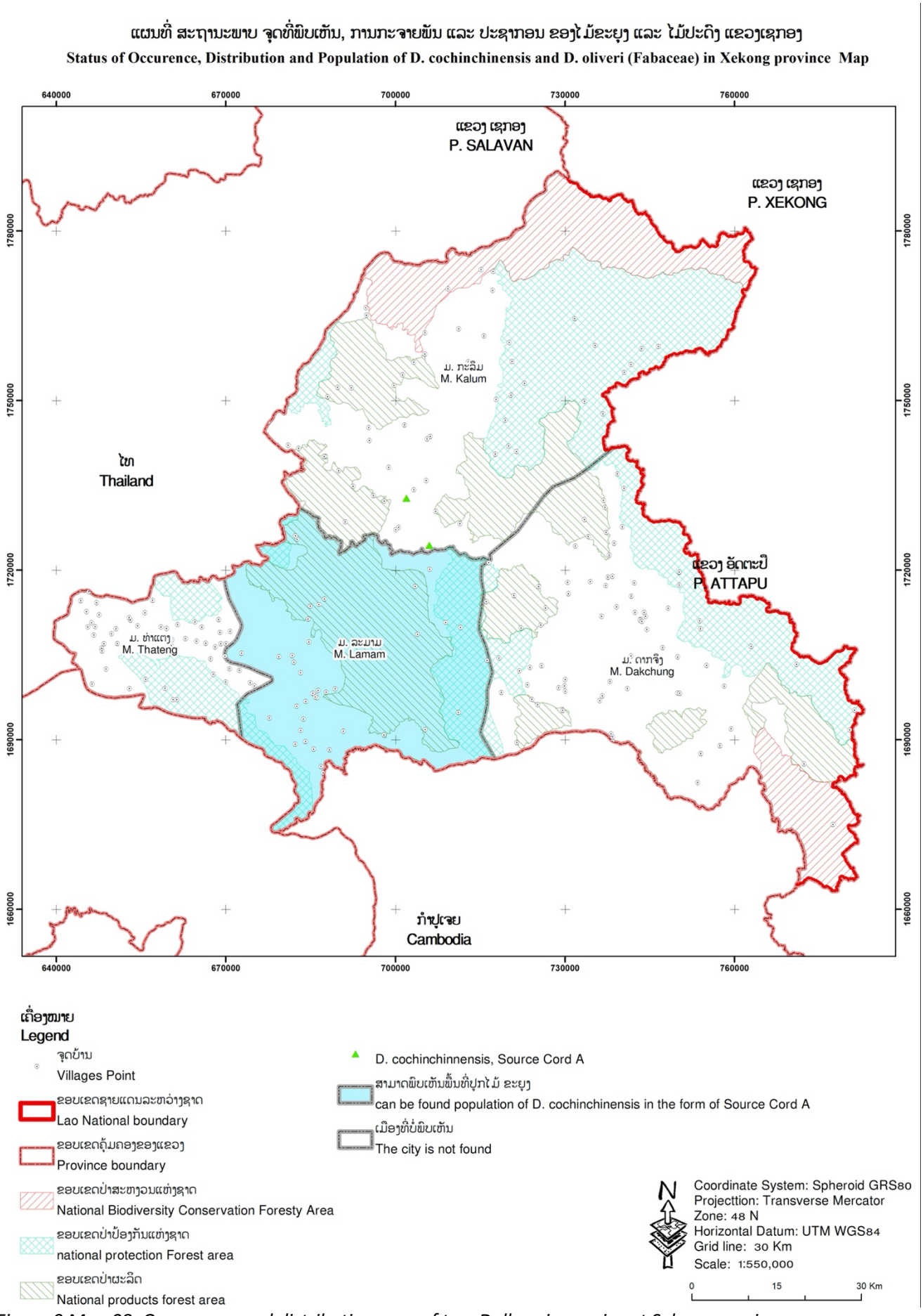

Figure 9 Map 08: Occurrence and distribution map of two Dalbergia species at Sekong province

Table 20 Population of *D. cochinchinensis* and *D. oliveri* identified through the field survey in Sekong province

CITES source code / description	**Total of Records in province**	***D. cochinchinensis***		***D. oliveri***	
		Number of individual trees	**Percentage of total trees that were recorded in the province**	**Number of individual trees**	**Percentage of total trees that were recorded in the province**
Source code W Natural trees in natural forests	0	NA	0	NA	0
Source code Y Natural trees outside forests	5	NA	0	5	100
Source code A Planted trees	0	NA	0	NA	0
Total tree	5	NA		5	

Developing CITES Non-Detriment Findings for Rosewoods in Lao PDR

Report on the status quo of rosewood species of *D. cochinchinensis* and *D. oliveri* in Lao PDR

Part 3:
Conclusions and recommendations for Non-Detriment Findings (NDF) for the two rosewood species

By: National Agriculture and Forestry Research Institute

Supported by:

UN-REDD- Sustainable Forest Trade in Lower Mekong Region, and the CITES Secretariat

December 2022

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I. Background

The government of Lao PDR currently categorizes the two rosewood species of the genus *Dalbergia* (*D. cochinchinensis* and *D. oliveri*) as under its Tree List I[1] prohibiting harvest from the wild unless otherwise authorized. Under the framework of CITES Article XIII compliance process for Lao People's Democratic Republic, since 1 November 2018, the Standing Committee has established a recommendation to suspend commercial trade in these two Dalbergia species.

> *… shall suspend commercial trade in specimens of the genus Dalbergia spp., including finished products, such as carvings and furniture, from the Lao People's Democratic Republic until Lao PDR makes scientifically based non-detriment findings for trade in the relevant species, including* D. cochinchinensis *and* D. oliveri *in the country to the satisfaction of the Secretariat. (CITES Notification No. 2018/083)"*

To lift this trade suspension, Lao PDR needs to develop a Non-Detriment Finding (NDF) and report to CITES Secretariat in line with the relevant recommendations under the Article XIII process for Lao PDR.

Under the UN-REDD Lower Mekong Initiative - Sustainable Forest Trade in the Lower Mekong Region, in 2021, FAO and the National Agriculture and Forestry Research Center (NAFRI), entered into a Letter of Agreement with the objective of developing an NDF for the two sanctioned rosewood species. Technical support was provided from FAO as well as from the CITES Secretariat.

This report is Part 3 of a set of three reports which together compose the report on recommendations from the best available information on status quo of rosewood species of *D. cochinchinensis* and *D. oliveri* in Lao PDR based on literature review, data analysis and field survey, as of 2022.

This report presents the recommendations to the NDF for submission, and recommendations for a gaps, challenges and potential solutions to support the further development of a CITES-NDF on the *D. cochinchinensis* and *D. oliveri (hereforth referred to as the two rosewood species)*.

According to the results of literature review process (refer to Report 1), as the NAFRI team had reviewed technical reports, scientific paper, type specimen, raw data and database of national forest inventory and planning, as well as related government documents from province and district levels, areas were identified with existing populations of the two Dalbergia species – categorized in three CITES sources codes, according to the nature of their occurrence. These categories are:

- Wild or occurring naturally in natural forests (CITES Source code 'W')
- Artificially propagated or occurring in planted or plantation form (CITES Source code 'A'), and

[1] Forestry Law 2019 states, "Tree List I refers to species that are rare, have medicinal properties, are at risk of extinction, grow or can be cultivated only in a particular area, have slow growth, have a unique wood texture, and produce a highly durable wood. This list also includes all species listed in the CITES Appendices, such as *Dalbergia cochinchinensis, Cunninghamia sinensis, Pterocarpus macrocarpus*."

- Plants obtained through assisted production (CITES Source code 'Y')[2].

From the survey and collected information, it is evident that the two rosewood species have been harvested heavily in the last decades both for the purpose of timber use, as well as for conversion of the land on which they occur into other land uses. The two species in their natural habitat are now endangered in the country, but at the same time there are some efforts towards their conservation as well as for establishment of plantations in the case of *D. cochinchinensis*.

II. Conclusions and recommendations

2.1 Conclusions and recommendations for the NDF submission

The population of rosewood specimens in the country is still unknown; the findings of the study are limited to the areas actually inventoried and the general locations of potential occurrence in the eight provinces. Within two of these provinces, no specimens were identified that could fall under CITES definition of source codes wild 'W' nor plants obtained through assisted production 'Y', in accordance with CITES Resolution Conf. 11.11 (Rev. CoP18). The locations for which the field inventory and mapping (refer to Report 2) was conducted on is based on information obtained through interviews and literature review. It is noted that this information is based on general knowledge of provincial and district level staff, and research to back this is limited.

The understanding of the NAFRI study team of the results of the survey is that the population of the two *Dalbergia* species for Source code W and Y is extremely low. While a more strategic or systematic approach to the inventory may yield further results, for now, the results of the field survey is the best available knowledge, and warrants a conservative approach of precaution, to recommend that harvest and commercial trade of these species is not permitted.

Noting the ban on commercial logging of natural forests in effect, commercial harvest and trade of the rosewood species of source code W is generally not envisaged by the government for the time-being. However, there are some circumstances for which harvest of these rosewood species may take place;

Table 1 Sources of rosewood specimen for potential export and recommendations

	NDF requirement	Recommendations
Pre-convention specimens that were acquired before these two rosewood species were added to CITES Appendix II, which was on 2 January 2017 (Source code O)	No	Export can be permitted after due legal processes[3] are taken.

[2] CITES, 2021.
[3] Due legal processes need to be defined separately under the leadership of the CITES Management Authority, and is outside the scope of this study.

Specimens removed through the conversion of natural forests (for example, into infrastructure such as roads or other forms of mass transport) (under Source code W)	Yes	Export not permitted for the time-being, and until an NDF (completed to the satisfaction of the CITES Secretariat and in accordance with the applicable recommendation under CITES Article XIII process) can be issued based on the results of an updated survey.
Confiscated specimens (Source code I)	Yes	
Assisted production specimens (Source code Y)	Yes	
Artificially propagated plants (Source code A)	Yes: only for founder stock of plants used to establish the cultivated parental stock in the propagation system involved.	Export not permitted until an NDF can be issued based on information of the founder stock of plants used. Establishment of a system that registers such information to be considered.

As above, commercial exports of these two rosewood species will not take place, until an NDF can be issued based on the results of an updated survey. No exports should take place until the NDF is completed to the satisfaction of the CITES Secretariat and in accordance with the applicable recommendation under CITES Article XIII process.

For Source code A, exports will be permitted only after and NDF can be issued based on information of founder stock of plants used. It is recommended that information be collected through consultation with representative stakeholders involved in plantations of these rosewood species to gain insight on the main potential sources of founder stock. Based on this information, a system to track the chain of custody of founder stock may be established for plantations, with guidance from the CITES Management Authority. Site and document based spot-checks may be carried out periodically.

2.2 Recommendations for further development of a NDF

It is recommended that in the future, when the government trade suspension recommendation under CITES Article XIII process is lifted, and before any harvest takes place, a field survey is rolled out to assess the population of Source code A, W and Y specimens to update a NDF for submission to CITES. Such field survey should be carried out in a systematic manner to better understand the occurrence of the two rosewood species. Such a survey may be embedded within a broader national forest inventory (NFI) campaign resources permitting but requires careful training of the NFI implementation team to be able to accurately identify these species. It is noted that in the case of combining with a broader NFI campaign additional measures may need to be considered, noting that the previous NFI campaign results yielded very limited information on rosewood.

In the meantime, the following are recommended measures to be taken as means to support data collection towards the NDF update to come at a future point in time;

- the results from the field survey conducted under this study (Report 2) to also be maintained and avenues and protocol for updating this inventory of rosewood population for Source codes W and Y to be considered;
- the inventory for harvested (eg./ie., through conversion of natural forests) or seized specimen of the two rosewood species to be maintained, including size of logs, and as far as possible location and timing seizure or information on origin of specimens;
- access and use of inventory information from neighboring countries to help inform or act as reference for comparison for the population of rosewood species in Lao PDR.

References

CITES Resolution Conf. 11.11 (Rev. CoP18). Regulation of trade in plants. Available at: https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-11-11-R18.pdf

CITES. 2021. Preliminary guidance on terms related to the artificial propagation of CITES regulated plants. UNEP-WCMC, Cambridge. Available at: https://cites.org/sites/default/files/eng/prog/captive_breeding/Art_Prop_Guidance_Feb2022.pdf

Analysis of legal procedures for conversion timber from conversion area

Developing CITES Non-Detriment Findings for Rosewoods in Lao PDR

By: National Agriculture and Forestry Research Institute

Supported by:
UN-REDD- Sustainable Forest Trade in Lower Mekong Region, and the CITES Secretariat

May, 2023

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I. Back ground

This report is the deliverable 2.2 under the LoA between NAFRI and FAO-UN-REDD.

1.1 The analysis of the Legal procedures for Conversion timber from conversion area

Term or nature of conversion area in Lao PDR, there are existing information, regulations, laws and relate documents under laws which indicated and described the meaning of conversion area, timber from conversion areas. Especially forest law 2019, decision, guideline and notification documents to inform the method procedures to implement the laws and regulation under law.

This part is aim to inform the comprehensive procedures in the implementation of legal extraction of timber from conversion areas.

1.2 Consulted legal documents:

The team had conducted literature review on the relate documents and supportive documents which concern about the legal procedures of the extraction timber from conversion areas including:

- Forestry law 2019;
- Land law 2019;
- Environment Protection Law (revised version), Ref. no. 29/National Assembly., 2012
- Decisions, regulations under laws.
  - Decision Letter on Tree List I, II & III, Ref. no. 0448, Date: 06 April 2021, MAF.
  - Decision no. 0182/MAF, the establishment of timber harvest division and state company for timber harvesting enterprise, date: 23 February 2009, Vientiane, Lao PDR
  - Decision no. 32/PM Lao on Acceptance of the forest meeting agreement regarding the forest management, forest inspection, and forest enterprise, date: 6 March 2012.
  - Decision of MAF on the roles & mandates of Department of Forestry Ref. no. 1505/MAF date: 22 April 2022
  - Decision on the harvest management of timber and NTFPs from conversion forest area to other purpose utilization (Draft version, revised from Ref. no 0112/MAF). Vientiane capital, Lao PDR
  - Decision on the implementation of forest inventory in Lao PDR, Ref. no. 0108/MAF, date: 20 April 2005, Vientiane capital, Lao PDR
  - Decision on the Prohibit list of goods for Import and Export, Ref. no. 0848/MOIC, date: 13 Sept. 2021.
  - Decision on the regulation of measurement of timber, log, stump, and grading of timber, Ref. no. 0116/MAF, date: 17 May 2007, Vientiane capital, Lao PDR
  - Decision on the regulation of measurement of timber, log, stump, timber for energy and grading of timber, Ref. no. 0902/MAF, date: 16 July 2021, Vientiane capital, Lao PDR
  - Decree on CITES/348, Vientiane capital, Lao PDR

- Decree on the ban of timber harvest, Vientiane capital, Lao PDR (Prime minister office, 1991).
- Decree on the implementation of Social and Environmental Impact Assessment, Ref. no. 389/GoL, date: 20 Oct. 2022.
- Definition of legal timber in conversion area, (TLD2_v5.0_02/03/2020).
- Guideline for biodiversity curriculum study, Vientiane capital, Lao PDR (Nanthavong,. K, et al. 2017)
- Instruction Letter on the implementation of Certification and cutting natural timber and planted timber including fruit trees existing individual land, private land and state land, Ref. no. 3684/MAF, date: 16 Aug. 2022.
- Instruction letter on the implementation of Social, Environment & Natural Impact Assessment from investment and development projects, ref. no. 8030/MONRE, date: 17 Dec. 2013.
- Instruction Letter on the management of timber transportation from production forest, conversion forest, infrastructure area among log landing I to II and III, Ref. no. 0131/MAF, date: 27 Jan. 2021.
- Instruction Letter on the Exportation of timber from plantation, reference no. 0981/MOIC, date: 19 October 2021.
- Instruction no. 0962/DoF on the instruction of transportation of timber from harvesting area to log landing II, 9 April 2010.
- Notification guideline on mitigation and prevent the trading of protected species, Vientiane capital, Lao PDR (Prime minister office, 2011).
- Notification letter no. 15/PM.Lao on the intensification of protection and monitoring on the harvest of timber, transport and timber enterprises, Vientiane capital, Lao PDR
- Notification letter on the prohibited activities of harvest and purchasing plants, timber including stump and small special plants species, protected species from natural forest, Vientiane capital, Lao PDR (MAF, 2010).
- Notification letter to Forest Section in province level on the intensification of timber harvest to avoid the impacts, Vientiane capital, Lao PDR (DoF, 2010).
- Order no. 15/PM Lao on intensively management, monitoring on harvesting, transportation, and forest enterprise, date: 13 May 2016
- Order no. 17/PM Lao on intensively manage and preserve timber, coordination on forest management and forest enterprise, date: 22 September 2008.
- Order on the temporary ban of timber harvest in production forest areas, Vientiane capital, Lao PDR (Prime minister office, 2013).
- Principal regulation on timber harvest from production forest area, Vientiane capital, Lao PDR (DoF, 2006).
- Regulation no. 1726/MOIC on the regulation for selling and purchasing timber, date: 23 July 2012.
- Regulation on the management of timber harvest and forest products, Vientiane capital, Lao PDR (MAF, 2000).

- Regulation on timber harvest and cleaning after post-harvest in hydropower development area, Ref. no. 0112/MAF, date: 25 Nov. 2008, Vientiane capital, Lao PDR (MAF, 2008).
- Technical Guideline for the Development of Report on Environmental impact assessment guideline (2016)

II. Definitions and processes involved in the generation of conversion timber

2.1 Legal procedures for Conversion timber from conversion area

According to the definition of legal timber in the TLD2-version 5, we have figured out the flow processes from conversion to harvest and auctions with the corresponding legal requirement in each process. For more detail please kindly see in figure 1, as bellow:

For the descriptions of processes which correspondent to the laws and regulations are describe in following sections below:

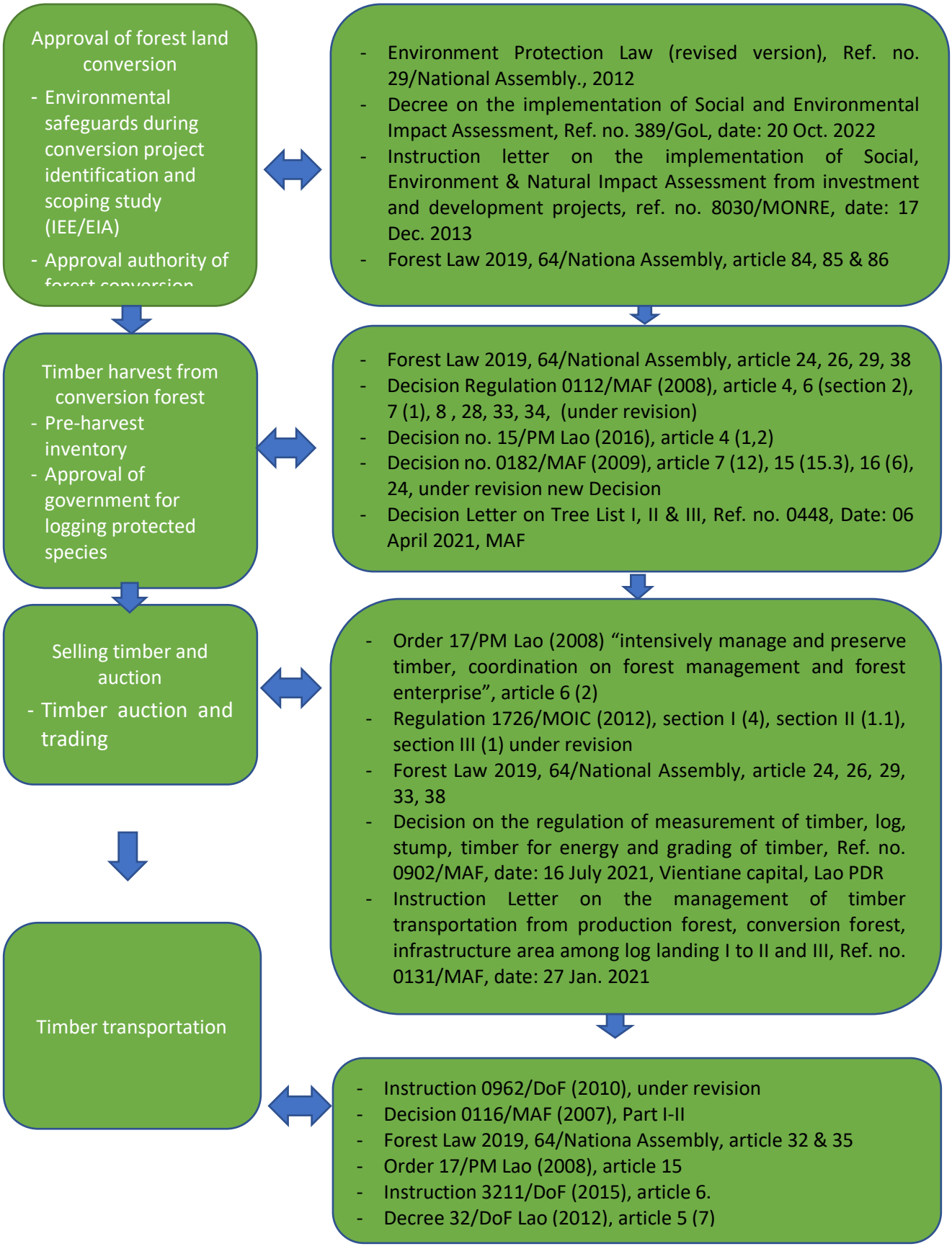

Figure 1 Flow diagram depicting the process from conversion to harvest and auction, and corresponding legal requirements

2.1.1 Definition of conversion forests

Table 1: the laws and regulations which related to the definition of conversion forests

Forest Law 2019, Ref. no. 64/National Assembly	
Article 3 (revised), section 12 (conversion of forestland):	*The change of forestland to another land-use category for a different purpose*
Article 81:	*Conversion of forestland can be either temporary or permanent in nature. Permanent conversion of forestland refers to conversion to another land category to serve a particular long-term objective, for example, the conversion of forestland for hydropower development, reservoir impoundment, sites for power pylons and mobile phone transmission masts and for resettlement. Forestland conversion is not required along electric power lines or roads. Temporary conversion of forestland refers to conversion to another land category to conduct a specific activity. When such an activity is completed, the area must be converted back to forest- land, for example, mining areas, roads to construction sites and temporary construction sites.*

2.1.2 Definition of Protected species

According to the forest law (2019) Ref. no. 64/National Assembly, there are 2 main articles which stated as the measure to consider the values of protected species. Furthermore, there is existing regulation under law had been issued to support the implementation of the conservation of tree species.

Table 2 the laws and regulations which related to the definition of protected species

Forest Law 2019, Ref. no. 64/Nationa Assembly	
Forest Law 2019, Ref. no. 64/Nationa Assembly Article 3	*Tree list I refers to species that are rare, have medicinal properties, are at risk of extinction, grow or can be cultivated only in a particular area, have slow growth, have a unique wood texture, and produce a highly durable wood. This list also includes all species listed in the CITES Appendices, such as Dalbergia cochinchinensis, Cunninghamia sinensis, Pterocarpus macrocarpus.* *Tree list II refers to tree species that grow and can be cultivated in specific areas, have slow natural growth and produce wood of medium durability, such as Dipterocarpus sp, Vatica harmandiana.* *Tree list III refers to tree species that grow and can be cultivated in most areas, that have a good natural growth rate and produce wood of low durability, such as Alstonia rostrata, Mangifera sp, Samanea saman.*
Forest Law 2019, Ref. no. 64/Nationa Assembly Article 134 (*Prohibitions for*	*Tree species in all list I, II & III are not allowed to "Cutting, purchasing, selling and transporting any naturally-grown trees of protected species or trees which are nearly extinct as determined in the approved list of timber species, without permission from the Government. Such tree species include: Dalbergia odorifera, Dalbergia cochinchinensis,*

Business operators), section 10	*Dyospiros Sp, Dalbergia oliveri, Dalbergia cultrata, Cunninghamia Sp, and Michelia champaca*
Order no. 15/PM Lao on intensively management, monitoring on harvesting, transportation, and forest enterprise, date: 13 May 2016	Section 2 "*Stop to export log, squared timber, processed woods, roots or stumps, trees or ornamental trees which extracted from natural forest to abroad in any cases, including those approval lists which the government already allocated before Order no. 15/PM Lao but not yet implemented; Unless, those they are being processed to final product according to the Decision No. 2005/MOIC, date: 28/9/2015, the final products can be exported.*"

For the schedule of revision or updating the Tree list I, II & III, there is no visual schedule to update/revise the list but it is the roles & missions of Department of Forestry accordance to the Decision of MAF on the roles & mandates of Department of Forestry Ref. no. 1505/MAF date: 22 April 2022.

2.1.3 Environmental safeguards during conversion project identification and scoping study (IEE/EIA)

The IEE and EIA are the processes in project identification and scoping, that lead to project study and approval; there are several assessment procedures which study impacts to social, nature and environment in short and long terms. The result of assessments are the criteria to consider and decide the approval of every projects and activities which ministry of natural resource and environment taking the roles.

Table 3 the laws and regulations related to environmental safeguards during project identification and scoping study (IEE/EIA)

Environment Protection Law (revised version), Ref. no. 29/National Assembly., 2012	*Article 22 the EIA is the procedure to analyze the problem to estimate the impact from the construction of project and infrastructure development project, which may happen for social, environment and nature. Including the consideration of problems which concern to the impact from the climate change, it is recommended to develop the report. In pararel with that report, it recommended to dfevelop the Environment and Social Mamanegemtn & Monitoring Plan.* *The reports have to be approved by the MONRE, before the implementation of the project. The Environment Impact Assessment procedures have to strictly follow the specific laws and regulations.*
Technical Guideline for the Development of Report on Environmental impact assessment guideline (2016), annex 8	*In the part of project consideration and decision, it required to intensively follow and conduct the relevant procedures accordance to the general baseline data for the comparation of physical and biological values before considering & deciding a project.* *Plants and their habitats: These information below need to be intensively followed and assessed to ensure that the impacts will be reduced and avoided:* *Group of data that recommended to conduct the study:*

	The prosperity/richness, distribution, diversity of biodiversity - *Their prosperity, distribution, diverse;* - *Rare species, endangered, or critical conditions;* - *Exotic species and alien species;* *Plant species which valuing to social, economic, culture or scientific (e.g. non-timber forest products, and etc…).*

In summary, to implement the IEE, the project owner is allowed to implement by themselves, while the implementation of EIA is strictly required project owner to hire the professional environmental assessment service to implement, article 58 (National Assembly, 2012). This is clearly indicated that the IEE report provide with fundamental information and can not recognize the qualitative and quantitative data. While the report of EIA totally provides the information with comprehensive data.

Initial Environmental Examination (IEE)

IEEs are required for small scale project according to their submitted and approved (to/by MONRE) "project plan" defining the project scale and scope - Instruction letter on the implementation of Social, Environment & Natural Impact Assessment from investment and development projects, ref. no. 8030/MONRE, date: 17 Dec. 2013, section (2.3).

Table 4 the laws and regulations in the process of IEE which related to the decision which concern to the Dalbergia population status

Decree on the implementation of Social and Environmental Impact Assessment, Ref. no. 389/GoL, date: 20 Oct. 2022, article 13, section 6	*To develop the report of IEE, project owner has to follow:* 1. *Develop IEE report on the environmental impact assessment in Lao; in accordance to the laws and related regulations and develop in the same time with the technical Economic Study;* 2. *Coordinate with PONRE and other concerned authorities to request the approval to implement the data collection and implement with the participation from communities on project development.* 3. *Data collection on the physical, biology and social economic in and around project sites, including the existing data. Data collection in the field, interview, and data analysis should follow the procedures. Source of data should be satisfied. Also, the results of data analysis need to be approved by related sectors.* 4. *It needs to study at least 3 options, each option needs to recognize the important meaning such as project location, scale of project, and the production procedure, including the explanation of the environment impacts. Comparation between 3 options and explain the reason of selection, disadvantage/advantage of the project development according to the selected option.* 5. *Study data of health, gender equity, and ethnic group to compile into fundamental part on the environmental impact.* 6. *Develop the specific Environment and Social Management & Monitoring Plan, in case of the project had the impact to soil, forest,*

	assets, agriculture productions, the project has to develop the action plan to restore, compensate and replace the negative impacts with effective actions. All action plans need to follow and strictly follow the concern regulations and laws. 7. *Make sure that the involvement of communities' participation engages in the implement of each procedure. Organize the meeting with communities in order to disseminate and listen commends from the communities and committee members.*
Decision on the harvest management of timber and NTFPs from conversion forest area to other purpose utilization (*Draft version, revised from Ref. no 0112/MAF*). Vientiane capital, Lao PDR	*Article 7: the verification & certify of forest before conversing forestland is the verification of impact which may happen to forest and forestland, wildlife and biodiversity, including the estimation of advantage & disadvantage from the project development. These tasks are belonging to the agriculture and forestry sector's responsibility.* In order to study and verify the forest area prior the conversion forestland, agriculture and forestry sector taking the role to assess and monitor including estimation of the disadvantage and advantage of the project before decide to approve. NAFRI team analysis: Though there are the several technical consultation procedures implemented by the concern steering committee to consider and approve whether it is low or extreme impacts, but the verification does not have specific criteria and standardize to be the reference for the decision.

Regarding the IEE study, there are 6 documents that projects need to prepare and submit to MONRE, of which, the preliminary study report is the most concern to the assessment of biological matter. Due to that report needs to contain information of existing of tree species in & surround the project site. Nevertheless, the information of tree species in this report just contains the fundamental information such as check list of existing species, it excludes the quality and quantity information. And another relevant document is the minutes of the consultation of steering committee which considering the degree of impacts. However, those comments in the minutes are not meaning enough to change and force the project to conduct the detail assessment again.

In summary, IEE assessment is require only the preliminary study, due to it is for small scale project, detail assessment with quality & quantity information is not required. Whenever the project being approved with preliminary assessment alone, this may vulnerable and risk to the population of 2 Dalbergia tree species, if they are existing in and surround the project site.

Environment Impact Assessment (EIA)

EIAs are required for large scale or mega project according to their submitted and approved (to/by MONRE) "project plan" defining the project scale and scope - Instruction letter on the implementation of Social, Environment & Natural Impact Assessment from investment and development projects, ref. no. 8030/MONRE, date: 17 Dec. 2013, section (2.3).

Table 5 the laws and regulations in the process of EIA which related to the decision which concern to the Dalbergia population status

Instruction letter on the implementation of Social, Environment & Natural Impact Assessment from investment and development projects, ref. no. 8030/MONRE, date: 17 Dec. 2013, section (2.5; part II, section 2.9)	- In order to planning the scope of study area, the project owner need to detailly indicate the scale of environment impact assessment through propose the impacts that may happened by the project development; - Also, the activities planning need to be detailly developed for the implementation of EIA; - The EIA proposal is required to strictly prepare & follow the. - The EIA proposal document should write in Lao. - Once the EIA proposal is complete and ready to submit to MONRE, the project owner need to issue the application letter and submit with EIA proposal to MONRE. - The implementation of EIA assessment is intensively implemented. However, in terms of forest inventory or assessment, it can not be survey for 100% of the total forest area. While, they set up systematic survey plots only 2% for the scale 1:1,000 ha.
Environment Protection Law (revised version), Ref. no. 29/National Assembly., 2012	- Issue the certificate of EIA for the project owner, once the report is accepted and fully completed. - In case of the reports and mitigation plan is not complete properly, MONRE will then ask project owner to revise and resubmit again before issue the certificate for the project. - In case of the report found the extreme negative impacts for social, nature and environment, the project is not meet the environmental policies of Lao PDR. The MONRE will recall and reject the application of the project.

Once the project owner had been allowed to conduct the EIA, the project owner has to prepare report with 15 copies & submit to MONRE, in order to share and request technical review from relevant sectors in central and local levels with proper timeframe, totally 150 days in order to get the result of reviews. At this point, if there is a sector does not reply any comment or suggestion, it is considered that those they are agree with the report. By the way, the expertise of each sector which endorsed by MONRE to be a reviewer need to be the third body, has not relationship with the project owner and is not any kind of beneficial of the project owner.

According the Decree on the implementation of Social and Environmental Impact Assessment, Ref. no. 389/GoL, date: 20 Oct. 2022, in the second and third process, if the result of IEE/EIA indicate found that the project will produce with extreme negative impacts for social, nature and environment, the project is not meet the environmental policies of Lao PDR, MONRE will recall and reject the application of the project. This mean that if the populations of Dalbergia tree species existing in the project area with dense populations, the project will also recall and reject for the approval.

2.1.4 Approval authority of forest conversion

Table 6 the laws and regulations related to approval authority of the forest conversion

Forest Law 2019, Ref. no. 64/National Assembly Articles 83 – 86	• *Government has the authority to make decisions on the conversion of forestland categories to other land categories based on a proposal from the Ministry of Natural Resources and Environment with the agreement of the Ministry of Agriculture and forestry and local administration authorities for the following:* *1. Conversion of District Protection and Conservation forestland;* *2. Conversion of degraded forestland that cannot be regenerated naturally covering areas between one hundred and one thou- sand hectares (100-1,000 ha) per one activity;* *3. Conversion of barren forestland that cannot be regenerated naturally covering areas between two hundred and ten thousand hectares (200-10,000 ha) per one activity.*
	• *If the forestland areas to be converted are greater than the areas specified in 2 and 3 above, the Government shall submit a proposal for approval by the National Assembly. The National Assembly: has the authority to make decisions on the conversion of national protection, national conservation forestland, production forestland and provincial protection and conservation forestland to other land categories, based on the proposal from the government.*
	• *Provincial people's council: has the authorities to make the decision on the conversion of forestland categories to other land categories based on a proposal from provincial administration authorities for the following:* *1. Conversion of Village's Protection and Conservation Forestland;* *2. Conversion of degraded forestland that cannot be regenerated naturally for areas covering less than one hundred hectares (100 ha) per one activity;* *3. Conversion of barren forestland of areas covering less than two hundred hectares (200 ha) per one activity.*

2.1.5 Pre-harvest inventory

Table 7 the laws and regulations related to requirements for a pre-harvest inventory

Forest Law 2019, Ref. no. 64/National Assembly	
Article 24 (New) Timber harvesting inventory in Forest Land Conversion Areas	*Timber harvesting inventories in forestland conversion areas shall only be conducted in areas that are approved by the Government and shall be done by the agriculture and forestry sector as follows:* ***I.*** *Demarcate the area for timber harvesting;*

	II. *Survey and collect data on tree species, number of standing trees, and estimate the volume of timber according to technical standards;* **III.** *Summarize the data from the survey and report to the Government for consideration.*

2.1.6 Approval of government for logging protected species

Table 8 the laws and regulations related to the approval of the government for logging protected species

Decision Letter on Tree List I, II & III, Ref. no. 0448, Date: 06 April 2021, MAF.	All of tree species indicated in the list I are prohibited for harvest, cutting and trading if without the permission of the government of Lao PDR.

In summary, no matter the tree species is listed in the List I, II or III, if it is provided with greater beneficial for social, national economic and not harmful for environment and nature. It is possible to considered by the government to operate the harvesting and compensation will be arranged in accordance to the regulations.

2.1.7 Timber auction and trading

According to the forest Law 2019 and the Decision on the regulation of measurement of timber, log, stump, timber for energy and grading of timber, Ref. no. 0902/MAF, there is an article which is correlating and concerning to the implementation of Timber Auction and Trading. For more information please see in table 9 below:

Table 9 the laws and regulations related to the definition of timber auction and trading

Forest Law 2019, Ref. no. 64/National Assembly Article 33	*Trading of logs harvested from production forests, forest- land conversion areas as prescribed in article 28 and 29 of this law, and timber confiscated by the State, shall be entered into the open bidding process with approved factories that meet the required standards so as to ensure maximum benefit to the State. Bidding for timber shall be conducted widely, publicly, transparently, and fairly, giving all bidders the opportunity to purchase timber for their factories. Money obtained from the bidding shall be transferred to the State Treasury.* *"The trading of timber owned by individuals, legal entities or organizations is the responsibility of the owner of the plantation or planted trees."*
Decision on the regulation of measurement of timber, log, stump, timber for energy and grading of timber, Ref. no. 0902/MAF, date: 16 July 2021,	*The timbers in log landing II are required to comprehensively measure, grading and listing by the agriculture and forestry sector before handover to industry & commerce sector (Instruction Letter on the management of timber transportation from production forest, conversion forest, infrastructure area among log landing I to II and III, Ref. no. 0131/MAF, date: 27 Jan. 2021)*

Vientiane capital, Lao PDR	

2.1.8 Timber exportation

Regarding the laws and the regulations which corresponding to the management of Timber Exportation to the aboard, there is a new regulation under ministry of commercial and industry and it was recently endorsed October 2021 19th. There are many sections intensively instruct on the implementation of timber exportation, including the guideline for exporters in order to ensure how to prepare legal procedures. However, this regulation is objected to provide the instruction for the exportation of timber form plantations only. While, there is not specific regulations to advice the procedures of the exportation of timber from natural forest and precaution timbers (timber from conversion areas).

III. Conclusion

The laws and regulation to define of conversion forest are existing such Forest law 2019, article 3 and 81. As the same corresponding to the definition of protected species, there are articles 3 and 134 under forest law 2019 which stated clearly about the meaning of protected species.

Regarding the laws and regulations which concerned to the procedures on project consideration and decision for approval, the IEE and EIA procedures, the Environment Protection Law (revised version), Ref. no. 29/National Assembly, 2012 and Instruction letter on the implementation of Social, Environment & Natural Impact Assessment from investment and development projects (ref. no. 8030/MONRE, date: 17 Dec. 2013). Decree on the implementation of Social and Environmental Impact Assessment (Ref. no. 389/GoL, date: 20 Oct. 2022), article 58 stated that "*to conduct IEE study, the project owner is allowed to implement by themselves, while for an EIA the project owner will hire a professional environmental assessment service to implement.*" This is clearly indicated that the IEE report provide with fundamental information and can not recognize the qualitative and quantitative data. While the report of EIA totally provides the information with comprehensive data.

Also, the laws and regulations on approval authority of forest conversion, there are articles 83 to 86 under forest law 2019 which clearly stated the implementation and responsibilities of each authority level.

In summary, the most vulnerable risk & gaps which may happen in the procedures of timber extraction from conversion area is only the procedure of the implementation on IEE study, due to the regulation of this procedure require IEE study to report with fundamental information and can not recognize the qualitative and quantitative data. While the report of EIA totally provides the information with comprehensive data.

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Draft - Long-term rosewood conservation for natural forest

Developing CITES Non-Detriment Findings for Rosewoods in Lao PDR

MAY 1, 2023

By: National Agriculture and Forestry Research Institute
Supported by: UN-REDD- Sustainable Forest Trade in Lower Mekong Region

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Foreword by DG of NAFRI

In Lao PDR, *Dalbergia* tree has been well known used since ancient times, especially *D. cochinchinensis* and *D. oliveri* these two species for house construction, furniture making, and so on, due to the abundance of forest resources. It is evident that the two rosewood species have been harvested heavily in the last decades both for the purpose of timber use, as well as for conversion of the land on which they occur into other land uses. The NAFRI and NUOL combined field survey team collected data through interviews and through field surveys inventorying population of the two Dalbergia tree species according to the three CITES source codes applied in this study.

It is recommended that in the future, when the ban on logging of natural forests is lifted, and before any harvest takes place, a survey is rolled out to assess the population of Source code W and Y specimens. In the next steps, we have strongly recommended as to establish a sustainable harvest quota, it is important to understand the status of the potential harvest sites and to develop thorough inventories of species as occurrence, distribution and population status of species.

Acknowledgement

We would like to express our gratitude to all the staff, experts and various institutions such as NAFRI, DoF, FFS, FNS and PAFOs. That has contributed to the successful creation of this manual, gratitude to the network for its initiative and contribution in terms of innovation. We would like to express our gratitude to the donors who provided financial support for the publication. The FAO, CITES and IUCN, that contributes to achieving the goals of poverty eradication and the United Nations Goals

I. Introduction

1.1 General condition

Rosewood has become one of the most expensive woods in the world due to its high demand in the commercial market, premium quality and characteristics. Around 60 species of rosewood of the genus *Dalbergia*, including *Dalbergia cochinchinensis* Pierre (Siamese Rosewood) and *Dalbergia oliveri* are widely distributed in Lao PDR and the wider Indochina Region. Threatened by illegal logging and trade, these Dalbergia *spp.* are vulnerable to overexploitation of the natural population and are rapidly disappearing from natural habitats. In 2013, all species of the genus *Dalbergia* spp. were listed in under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

NAFRI and NUOL team had conducted the field survey of distribution, occurrence, and population status of two Dalbergia species, totally 6 provinces, target areas covering Bolikhamxai, Khammouane, Savannakheth, Salavanh, Attapue and Champasack provinces and 24 districts are the survey sites and 52 village were involved in the survey plots (NAFRI, 2022). Base on the results, *D*. *cochinchinensis* of the three source codes were found at total 23 survey sites or districts, at 51 villages and 183 survey plots. Most of them were found in Bolikhamsay, Khammuan, Savannakhet and Salavan provinces. While, *D*. *oliveri* were found in eight survey sites across ten villages and 20 survey plots. Most of them were found in Khammuan, Savannakhet, Salavan, Champasack, Attapue and Xekong provinces.

In general, the result of the survey shows that *D*. *cochinchinensis* is widely distributed in the central to southern parts of the country, namely Bolikhamsay, Khammuan, Savannakhet, Salavan, Champasack, and Attapue provinces. On the other hand. D. oliveri is very rare and limited in distribution almost of them were found at Khammuan, Savannakhet, Salavan, Champasack, Xekong and Attapue provinces (figure 1).

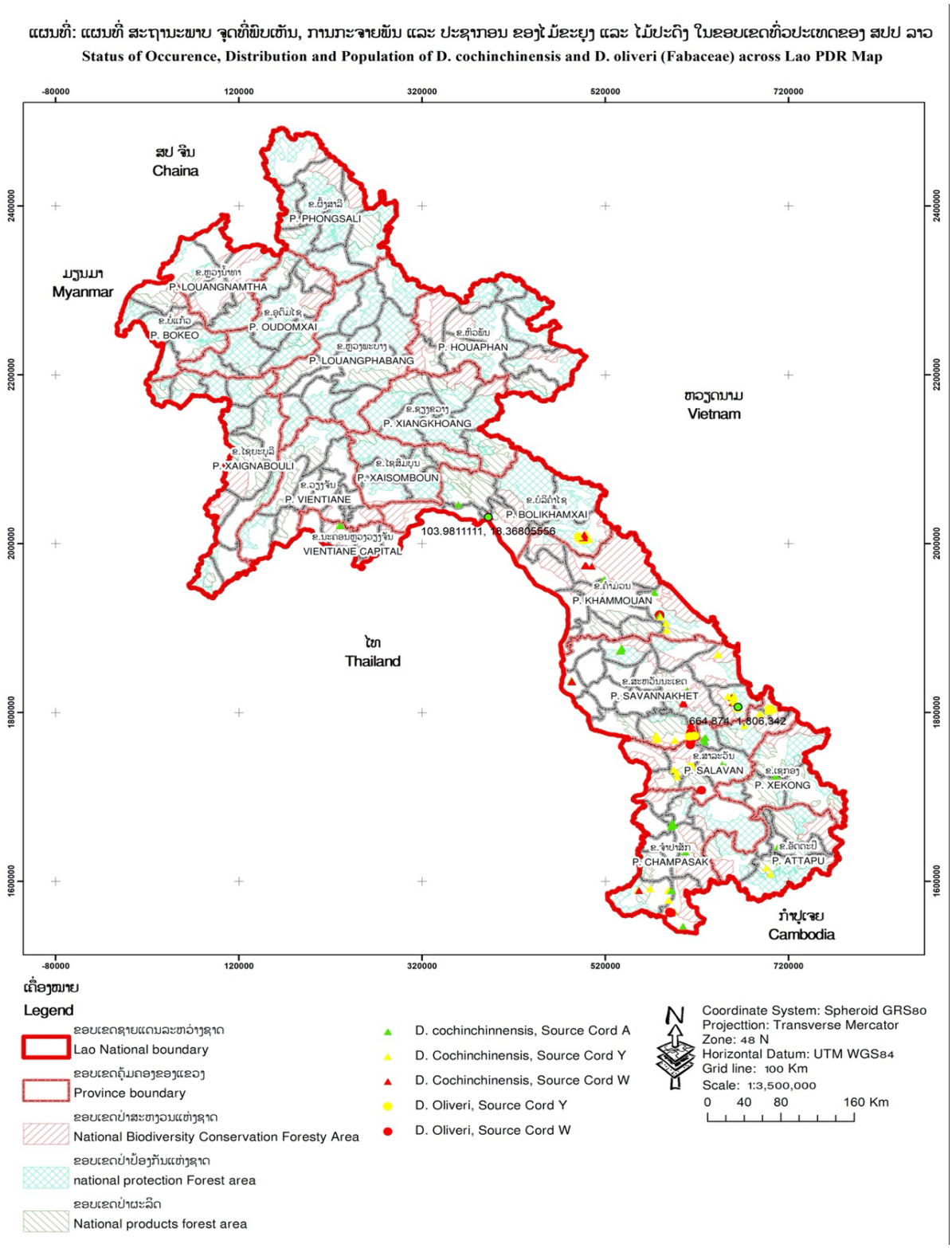

Figure 1 Occurrence and distribution map of two Dalbergia species in central and southern Laos

The investigation data can recognize that the population of the two Dalbergia tree species is extremely low, in particularly the seed production trees of source W & Y. However, the accurate population number in the country is still unknown. Actually, the survey had conducted and general locations of potential occurrence in the eight provinces (within two of these provinces, no source code W and Y is known to exist) are mapped based on information obtained. While a more strategic or systematic approach to the inventory may yield further results and warrants a conservative approach. Some occurred in national biodiversity conservation area/protected area where legally protection already in place, another also can be found in different land use such as, agriculture land, production forest land, and other land use. Their situation is out of resilience for survival and those existing habitats/occurrences cannot be quarantined that their habitats be saved.

However, it is important to understand the status of population where it needs to conduct thorough inventories of species as occurrence, distribution and population status of species with key questions and considerations that are: - What is the occurrence and distribution of species? (Within the potential sites); - What is the population size (density, frequency, abundance etc…of each species); - Where is the site located? (Geospatial data); also, more detailed understanding of the inventory methodology that are: Sampling methods (systematic, random, stratified, or others); - Sampling design as shape and size of sampling plots; Dates or season of sampling (year, month, day (s); - Number of plots to sample in consistency with relevant forest management plan (if available) and create and keep a detailed standardized sampling log.

1.2 Conservation status of two Dalbergia species

There are existing laws, regulations, policies and strategies which highly supports the conservation of these two species. However, there is no specific conservation facilities which can be the scientific based to promote the conservation approach for 2 *Dalbergia* species and also, not so many scientific publish on conservation *Dalberegia* spp. in Laos

Laos doesn't have any specific protocol conservation *Dalbergia* species. Supporting data is insufficient as national population structures, sizes and trends: widely or strict/limited distribution? It is fragment or continued? Increase or decrease. Also, the National Conservation Status as the National Red List of species for conservation of Lao did not publish.

As widely known, these two Dalbergia tree species had been allocated in the protection status of the national regulation of Lao PDR. It is in List I, which it prohibited for cutting, selling and processing, unless they are legally approved by the government. Particularly, these tree species are considered as the group of highest economic value timber tree species for commerce. Nevertheless, there is no regulation and/or relevant support official notification to specifically encourage as priority for planting.

Dalbergia tree plantations were planted by the government projects since 1990s. Initially, the plantations were developed to identify the best species, provenances, and establishment methods. The main species planted were *D. cochinchinensis* and *D. oliveri*. Today, the remaining trial plots, which are located in the Conservation Forest of the Faculty of Forest Science, NUOL and there is one plot in Vientiane Capital which is managed by the Forest Research Centre under the Ministry of Agriculture and Forestry which are probably some of the oldest remaining trials of these species in Laos. A part from these, there are still many plots managed by PAFO and DAFOs in central and southern Laos.

There are good practices of conservation activities already existing, Darwin Dalbergia project had established 2 ex-situ and 2 In-situ conservation units in Nong & Thapangthong district, Savannakhet province. Occurrence data and their habitats is the fundamental information that can used for further preparation of action plan and strategic plans to establish In-situ/Ex-situ conservation units for these two Dalbergia tree species.

The initiative conservation activities Dalbergia tree species are limited; In order to ensure that the two Dalbergia species are conserved and restore the number of population and habitats, the conservation is necessary.

The objective of this strategy is:

1.) To ensure the stability and sustainable of the Dalbergia population in both quantity and quality;
2.) To propose the key authority actor to further recognize and encourage the conservation of these Dalbergia tree being effectively implement.

II. Threatened and challenge to the conservation of two Dalbergia tree species

2.1 Threatened of Dalbergia population and habitats

Over many years, the government had paid efforts to manage, conservation and protection protected and near extinction tree species. Of which, these two Dalbergia tree species also included. Although, there were many national laws and regulations had been endorsed to enforce the implementation of conservation approach, but there still have many cases of illegal logging, disturbance & destruction activities, in particularly the infrastructure development project, land use and land conversion for agriculture production which is the main impact to destroy their natural habitats/distribution.
From the survey and collected information (NAFRI, 2022), it is evident that the two rosewood species have been harvested heavily in the last decades both for the purpose of timber use, as well as for conversion of the land on which they occur into other land uses.

2.1.1 Legal and Illegal logging

According to the notification/order letter no. 15 of the prime minister (2016) "*on the intensification of protection and monitoring on the harvest of timber, transport and timber enterprises*", the implementation of forest or timber harvesting in Lao PDR had intensively & strictly followed the rules accordance to the national laws and supportive regulations.

Especially there are many revised laws and regulations such as **MAF., 2021** "*Instruction Letter on the management of timber transportation from production forest, conversion forest, infrastructure area among log landing I to II and III, Ref. no. 0131/MAF,*" **National Assembly, 2019 "***Forestry Law, Vientiane capital, Lao PDR,*" **Ministry of Agriculture and Forestry (draft of revision from the decision 0112)** "*Decision on the harvest management of timber and NTFPs from conversion forest area to other purpose utilization*" and etc... This helped forest sectors enable to protect forest resource and made the illegal activities decreasing. According to the DoF (2021), there were 619.641 cubic meters had been allocated/approved to harvest within conservation areas across the country. This could vulnerable or risk to the existing population of two Dalbergia tree species.

2.1.2 Threatened of natural habitats

According to DoF (2021), there are natural forest had been approved by the government to converse into the infrastructure development areas which worsted the volume of timber to be harvested about 619.641 cubic meters. This mean that if the proposed conversion areas cover their natural distribution, the project may destroy the regeneration populations, and make the natural forest (habitats) become fragment, and narrow down their ability of natural regeneration.

2.2 Challenge of the conservation of Dalbergia tree species

Over them times, there is no specific master plan to conserve two Dalbergia tree species. By the way, there is a strategic plan for biodiversity conservation, forest laws, environmental laws, and other related regulations which support the conservation efforts.

The implementation of management, conservation and protection of population & habitats for two Dalbergia tree species still needs more participation from many stakeholders in various aspects such as technical aspect, financial support, and policy aspect. The main challenges for conservation of these two Dalbergia tree species are: 1.) population status which is the fundamental data to support the efficiency of conservation, 2.) land use management to ensure the sustainable use of land for conservation (Ex-situ & In-situ), 3) capacity and social awareness to against the attraction from high market demand.

2.2.1 Challenge of documenting population distributions status

Species identification in the field survey is noted to be a significant challenge, particularly in the distinction between *D. oliveri* and *D. cultrata* which requires careful study of different tree components to accurately identify the species.

According to NAFRI (2022), occurrence, distribution and population status of two Dalbergia tree species already recognized. However, it is necessary to continue assess with key questions and considerations as following:

- What is the occurrence and distribution of species? (within potential distribution sites);

- What is the population size (density, frequency, abundance etc…of each species);
- Where is the site located? (geospatial data);
- Which are the criteria for selection of the proposed conservation site? (to know its physical and vegetation characteristics).

2.2.2 Limitation of conservation measures

According to the Darwin Dalbergia project implemented by NAFRI since 2018 to 2021, there were many initiative activities had been done especially the investigation of occurrence data, population status, and development of conservation units (Ex-situ & In-situ) of 3 Dalbergia tree species (*D. cochinichinensis*, *D. oliveri* & *D. cultrata*). By the way, the number of developed conservation units still insufficient and can not cover for their natural habits across the country, due to the limitation of human resource, specific support policy, budget resource and technique.

2.2.3 Challenge of capacity building and social awareness in conservation

Capacity on conservation in both human and technical aspects still challenging, as well as to make social awareness on conservation still limit and challenging due to the livelihoods of local communities depend on natural resources. The encouragement to enact conservation activities into entire local and national levels still challenging. As the same, to incorporate the important of conservation into communication, education and public awareness program.

III. Initiative vision for strategic conservation of two Dalbergia tree species

This conservation strategy aims to ensure the stability and increasing population & habitats of two Dalbergia tree species through encourage communities' participation in management, conservation, and protection.

IV. Propose action plan and targets to achieve the long-term conservation strategy of two Dalbergia tree species

In order to ensure the effective implementation and achieve the conservation strategy for two Dalbergia tree species, this strategy has proposed 4 action plans and 10 target areas. Each action plan and target area has developed by reflecting to the existing limitations and challenges.

4.1 Action plan 1: Understanding & documenting population distributions status

Target 1: assessment of population resource and conservation status

- Assessment of population resource:
  1) Conduct more literature review;
  2) Encourage effective coordination within stakeholders in every level;
  3) Design and develop specific species inventory methodology but requires careful training of the inventory, ensure to capture their population (Source cord W & Y).

- Develop specific inventory methods with qualify data analysis;
- In case of randomly inventory, it is necessary to follow the principal methods of ecology survey which is focus on the highest, medium and lowest density.
- The purpose of inventory is recommended to focus on their habitats (forest structure, plant community, most threatened, and other physical factors such as soil, water, and slope. Including their population and population structure.
- In case already known that the population is small size, it is highly recommended to inventory 100%.
- To identify the potential target sites for population inventory, it is necessary to prioritize the natural habitats of Dalbergia tree species;

4) To implement inventory: inventory team need to need to have a good qualify knowledge on plant taxonomy, general knowledge of forestry inventory and sampling design);

5) Indicate the inventory timeframe: in order to enable the monitoring of population status in both quality and quantity, it is highly recommended to implement inventory in 5 years interval. Once the government of Lao PDR unlock the order no. 15/PM (2016), it is highly recommended to implement inventory 2 years interval.

6) It needs to develop the report of population status of these two Dalbergia tree species in every 2 and 5 years.

Currently, there are existing conservation initiative activities such as National Parks, NBCA/NPA, National Protection Forest in all levels (national, provinces and districts) already consider as In-situ conservation. However, the hot spot area or specific area where the density of population is existing cannot be recognized, it needs to implement another detail survey.

Also, more detailed understanding of the inventory methodology that are:

- Sampling methods (systematic, random, stratified, or others);
- Sampling design as shape and size of sampling plots;
- Dates or season of sampling (year, month, day(s);
- Number of plots to sample in consistency with relevant forest management plan (if available) and create and keep a detailed standardized sampling log.

Target 2: Develop materials and conduct research activities to provide concepts for conservation.

Due to there is limited reliable materials and research facilities providing with the conceptual of conservation for these two tree species. Also, both population and habitats of these Dalbergia tree species had been over exploited and exhausted to naturally regeneration. It needs to provide conservation concept, support and design protocol research on conservation assessments of 2 *Dalbergia* species in Laos, the human enhancement is the fundamental to ensure the effective conservation.

The action to be moved forwards is to develop the necessary materials and promote the implementation and application of research facilities on conservation activities. The following propose activities are important and necessary to implement:

- Establish a laboratory for research activities and develop propagation technology; multi-techniques to regenerate, germinate (tissue culture, root-cutting techniques) for seedlings production in case of the tree species *D. oliveri* which is shortage of seeds production;
- Develop and qualify technique on the conservation facilities: conservation guidelines, mapping genetic diversity, diversify concept of genetic conservation.
- Study the asexual reproduction system in various ways such as cuttings, graft (cuttings the branch), tissue culture, testing the appropriate planting period

4.2 Action Plan 2: Conservation measure

Target 3: Put in place national policy & legislation regarding conservation purpose

- Propose the government to specifically consider the conservation activity for these two species;
- Develop national program on specific conservation zones in their natural distribution areas;
- Develop supportive policies through considering a specific national regulation;
- Develop relevant measures to supports and make sure that their populations are restored, promote tree planting for economic purpose, conserve their genetic diversity.

Target 4: Prioritize natural habitats (ecology) area to be conserved

- Cooperate and encourage the participation from communities, investigate and demarcate their natural habitats which will be potential sites for conservation;
- According to NAFRI (2022), there are many provinces, districts and communities are potentially prioritized the habitats for conservation sites, such as Nakai & Boualapha districts, Khammouan province, Khamkuet district, Borlikhamsay province, Nong & Thapangathong districts, Savannakhet province, Lao-Ngam district, Salavan province, Khong district, Champasack province and Phouvong district, Attapue province. These districts contained with potential habitats that can be prioritized as habitats conservation area for these two Dalbergia tree species. It is necessary to encourage and identify to develop the natural habitat conservation for these two species.
- Encourage and continue investigate the specific habitats areas of these two species, in order to develop In-situ conservation units.

Target 5: Develop *in situ* to conserve genetic diversity across their ecological zone

According to the Forest Law (2019) and others relevance regulations under laws, there are initiative In-situ development approach already available such as national park, national biodiversity conversation area/national protected area, protected areas in province, district and village levels, national protection forest and etc… Yet, it is also considered as the In-situ

conservation. However, there is no action or existing area that set as conservation sites for their natural habitats (ecology) for these two species. Currently, there are existing conservation initiative activities such as National Parks, NBCA/NPA, National Protection Forest in all levels (national, provinces and districts) already consider as In-situ conservation. However, the hot spot area or specific area where the density of population is existing cannot be recognized, it needs to implement another detail survey.

To establish In-situ conservation unit, the existing habitats where these two species are naturally growth should be identified & make it available. In-situ conservation means to conserve the ecology and natural distribution, restore surround natural distribution areas.

- Identification/protection existing seed stands or seed sources (in-situ) and establishment/expansion (ex-situ) of seed stands.
- Conduct comprehensive survey in the potential natural distribution areas at least 1 site per district, such as Nakai & Boualapha districts, Khammouan province, Khamkuet district, Borlikhamsay province, Nong & Thapangathong districts, Savannakhet province, Lao-Ngam district, Salavan province, Khong district, Champasack province and Phouvong district, Attapue province.
- Demarcate the most potential natural distribution area of these two Dalbergia tree species to establish the In-situ conservation unit.
- Promote the seedling production by using planting material from the good quality seed trees which existing in and surround In-situ conservation area. This is to ensure that planting material might not bring from other area.

Target 6: establish ex situ units to increase the flow of genetic distribution

Encourage and support public participation, ensure that the productivity process of these two Dalbergia tree species can improve the capacity of exchanging pollinate materials for their genetic diversity outside of their natural habitats, to encourage the utilization of good planting material with diversity of genetic, Ex-situ conservation unit can be the important facilities to provide and supply the good quality of planting material for planting promotion.

- Establish and maintain ex-situ research and conservation facility for two Dalbergia tree species;
- Establish a Natural History Museum and develop the methodology guideline on Ex-situ conservation construction;
- Survey and allocate the new habitats where fit to their ecology, in order to establish Ex-situ conservation unit for these two Dalbergia tree species;
- Survey and prioritize seed production trees as strictly control to ensure that seeds can sufficiently supply for seedling production across the country; incorporate and store seeds in gene bank;
- Encourage technical-suggestions on conservation into the regulations under law;
- Establish conservation resources Ex-situ where these 2 types of trees live in 7 districts in 6 provinces, such as Se Bang Fai District, Khammouan Province, Pak Kading District,

Borikhamxay Province, Vilaburi District, Savannakhet Province, Vapi District and Toumlan District, Saravan Province, Pathumphone District, Champasak Province, Xaysetha District, Attapheu Province.

- Promoting tree planting (for seed collection) in schools, pagodas, forestry offices, PAFO/DAFOs, NAFRI and other MAFF research or training facilities, MoE offices, etc
- Proceed in the form of conservation in the field samples such as for scientific research, genetic improvement, strengthening of genetic diversity, test samples of offspring, test samples of native species, genetic conservation samples, botanical gardens.

4.3 Building capacity and social awareness for conservation

Target 7: Develop master plan for capacity building with appropriate facilities in conservation

- Develop long-term and short-term capacity building programs as the facilities for conservation;
- Make availability of necessary conservation facilities and infrastructures;
- Develop the roles, mandates and respond institutions;
- Develop management regulation and administration for capacity building;
- Exchange and sharing knowledge, experiences and best practices with regional and internationals organizations;
- Develop specific Dalbergia conservation group.

Target 8: Disseminate and enact conservation activities entire local, national and regional levels

- Link/alignment conservation activities into the roles, mandates and responsibilities of entire local and national organizations;
- Promote planting of two Dalbergia tree species into the national planting program;
- Develop and encourage local/traditional cultures and knowledge to conserve population and its ecosystems and ensure the sustainable use;
- Raise awareness, establish information media about conservation of two Dalbergia tree species;
- Ensure the provision of knowledge, information and understanding of the two Dalbergia tree species which is required for its effective utilization, effective conservation and management.

Target 9: Incorporated the important of conservation into communication, education and public awareness program

- Promote cooperation between sub-national, national, regional and international levels in conservation and sustainable use of target species;
- Establish technical team to recognize/disseminate the current status of two Dalbergia tree species in national and local levels;
- Step up initiative coordination between Communication, Education and Public Awareness;

- Increase understanding of science-based knowledge by indigenous and local communities and policy makers;
- Develop mechanisms/platform for constructive dialogue and exchange of information and experiences among rangers, relevant stakeholders;
- Develop communication campaign;
- Develop specific conservation subject into the academical curriculum and extracurricular.

4.4 Monitoring and evaluation

Target 10: Identify and analyze the gaps & challenge of the implementation on conservation

- Assign steering committee to monitor and evaluate the implementation, progress, and outputs;
- Develop the action plan to ensure the effectiveness of monitoring and evaluation;
- Up scaling conservation and monitoring approaches for two Dalbergia tree species;
- Monitoring and evaluate the conservation status of two Dalbergia tree species in each phase;
- Monitoring the implementation of each goal;
- Establish mechanism of evaluate & monitor the impacts of communication, education and public awareness programmers on the conservation of two Dalbergia tree species to ensure that they improve public awareness, change behavior and support the achievement of the objectives.
- Develop the monitoring and evaluation reports to provide comments, suggestions and potential solutions to improve the implementation of long-term conservation strategy.

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