CONVENCIÓN SOBRE EL COMERCIO INTERNACIONAL DE ESPECIES AMENAZADAS DE FAUNA Y FLORA SILVESTRES

Trigésima tercera reunión del Comité de Fauna
Ginebra (Suiza), 12 – 19 de julio de 2024

Cumplimiento

Examen del comercio significativo de especímenes de especies del Apéndice II

ESPECIES SELECCIONADAS PARA SU EXAMEN DESPUÉS DE LA COP19

1. Este documento ha sido preparado por la Secretaría.

Selección de combinaciones especie/país que han de revisarse

2. Tras la 19ª reunión de la Conferencia de las Partes (CoP19, Ciudad de Panamá, 2022), en la 26ª reunión del Comité de Flora (PC26; Ginebra, junio de 2023) se seleccionaron ocho taxa de 29 Partes para su inclusión en la Fase 2 del Examen del comercio significativo, como se refleja en el párrafo 6 del documento PC27 Doc. 15.1.

3. El 19 de junio de 2023, la Secretaría notificó a los Estados del área de distribución concernidos los taxa seleccionados; explicó la razón de esta selección; y solicitó comentarios sobre los posibles problemas en la aplicación del Artículo IV de la Convención para el comercio de esas especies. Se concedió a los Estados del área de distribución 60 días para que respondieran (es decir, hasta el 19 de agosto de 2023). La Secretaría recalcó que el objetivo principal de la solicitud era obtener la información necesaria para evaluar la aplicación del Artículo IV, párrafos 2 (a), 3 y 6 (a) en el Estado del área de distribución relevante. En la carta se incluyó el texto de la resolución; un resumen del calendario sobre la realización del Examen del comercio significativo; orientación sobre cómo responder a la consulta; así como detalles del tipo de información que el Comité de Flora tomaría en consideración al evaluar los casos seleccionados en su 27ª reunión (PC27, Ginebra, julio de 2024). La Secretaría señaló también que en ausencia de una respuesta o de información insuficiente, el Comité de Flora podía llegar a la conclusión de que “se necesitan medidas” y formular recomendaciones dirigidas al Estado del área de distribución, que, si no se aplican, podría conducir a que el Comité Permanente tome medidas, inclusive, en última instancia, la posibilidad de una suspensión del comercio de las especies pertinentes. Se alienta a las Partes a que trabajen en estrecha colaboración con sus Autoridades Científicas, así como con otros interesados pertinentes para garantizar que sus respuestas fueran tan completas como posible.

4. Como se anunció durante la PC26, la Secretaría no disponía de financiación externa para realizar 29 exámenes en profundidad de todas las combinaciones especie-país seleccionadas en la PC26. Como se señala en el acta resumida de la PC26 (véase el acta resumida PC26 SR), los casos en los que se confirmó que las Partes no eran Estados del área de distribución y en los que se explicaron las discrepancias en los datos sobre el comercio se eliminaron del proceso y se comunican como tal al Comité de Flora en la presente reunión. Esos casos se indican en la columna C del siguiente cuadro, junto con la justificación de su eliminación en la columna D. Esto deja una serie de 14 casos seleccionadas para su examen tras la CoP19, como se indica en la columna B del siguiente cuadro. Los Estados del área de distribución que respondieron a la consulta se indican en **negritas**, y las respuestas de los Estados del área de distribución incluidas en los exámenes en profundidad (columna B del siguiente cuadro) se presentan en el idioma en que fueron recibidas figuran en el Anexo 1.

A. Especie	B. País *confirmado* para la Fase 2 del ECS selección por la PC27	C. País *eliminado* entre la PC26 y la PC27	D. Justificación de los casos eliminados (cuando proceda)
Euphorbia poissonii	n/a	**Ghana (GH)**	Aclaradas las discrepancias comerciales. 75% del comercio con código de propósito S.
Dalbergia melanoxylon	Mozambique (MZ), **República Unida de Tanzanía (TZ)**	**Uganda (UG)**; **Kenya (KE)**	Aclaradas las discrepancias comerciales.
Dalbergia tucurensis	**Nicaragua (NI)**	n/a	n/a
Guibourtia tessmannii	**Camerún (CM), Guinea Ecuatorial (GQ)**	Gabón (GA)	No hay evidencia de comercio de especímenes silvestres de Gabón.
Osyris lanceolata	**Burundi (BI)**, Etiopía (ET), **Uganda (UG), República Unida de Tanzanía (TZ)**	**Botswana (BW),** República Democrática del Congo (DRC), **Kenya (KE),** Rwanda (RW), Sudáfrica (ZA), Sudán del Sur (SS)	Sólo las poblaciones de Burundi, Etiopía, Kenya, Rwanda, Uganda y República Unida de Tanzanía están incluidas en los Apéndices de la CITES; ninguna otra población está incluida en los Apéndices. Se ha excluido a Rwanda debido a la inexistencia de comercio de la especie en RW. Véase el párrafo 5 para consideraciones adicionales.
Aquilaria crassna	Viet Nam (VN)	**Tailandia (TH), Malasia (MY)**	Aclaradas las discrepancias comerciales. Malasia no es un Estado del área de distribución de poblaciones nativas de la especie. Tailandia solo permite exportaciones de plantaciones, parece que se han cumplido las exenciones de reproducción artificial.
Aquilaria malaccensis	**Indonesia (ID), Malasia (MY)**	**Singapur (SG), Tailandia (TH), India (IN)**	Aclaradas las discrepancias comerciales o las preocupaciones. Singapur no permite la extracción de sus poblaciones nativas. Tailandia solo permite exportaciones de plantaciones, parece que se han cumplido las exenciones de reproducción artificial. India formuló un DENP y aplica un cupo de exportación nulo para las extracciones silvestres.
Gyrinops spp.	**Indonesia (ID), Papua Nueva Guinea (PG)**	n/a	n/a

<u>En relación con la selección de *Osyris lanceolata* de todos los Estados del área de distribución, inclusive Sudán del Sur</u>

5. En la PC26, el Comité de Flora enumeró todos los Estados del área de distribución de *Osyris lanceolata*, más Sudán del Sur (véase el acta resumida PC26 SR). Species+ enumera a Botswana, Burundi, República Democrática del Congo, Etiopía, Kenya, Rwanda, Sudáfrica, Uganda y la República Unida de Tanzanía como Estados del área de distribución, pese que al parecer hay poblaciones nativas de la especie en la Península Ibérica, norte de África y la Península Arábica. De éstas, solo las poblaciones de Burundi, Etiopía, Kenya, Rwanda, Uganda y República Unida de Tanzanía están incluidas en el Apéndice II de la CITES. La Secretaría señala que las Partes no tienen la obligación de supervisar, regular o comunicar el comercio de poblaciones no incluidas de esta especie.

6. Asimismo, la Secretaría señala que el 79% del comercio comunicado en el documento PC26 Doc. 16.5 procede de Sudán del Sur (que no es un Estado del área de distribución según Species+), de orígenes desconocidos o de la República Democrática del Congo (una población no incluida en los Apéndices de la CITES). Solo el 21% del comercio se declara como procedente de Partes CITES, cuyas poblaciones están incluidas en los Apéndices (República Unida de Tanzanía, Uganda y Burundi). La mayoría de los Estados del área de distribución informan de que no permiten el comercio de la especie procedente del medio silvestre e indican que la mayor parte del comercio son reexportaciones.

7. Sin embargo, las respuestas de la República Unida de Tanzanía, Uganda, Burundi y Kenya indican también la extracción y el comercio ilegales de la especie. Estas preocupaciones están respaldadas por los resultados sometido por la República Unida de Tanzanía, Uganda, y Kenya en el marco del Programa sobre especies arbóreas de la CITES. La presentación de Uganda contiene una lista de confiscaciones y una lista de incidentes relacionados con el seguimiento y la aplicación ineficaz de las regulaciones de extracción y comercio (páginas 13-14 y páginas 22-24). Basándose en estos informes, la Secretaría consultó la Base de

datos sobre el comercio ilegal CITES. En abril de 2024, solamente Kenya ha comunicado confiscaciones de la especie en sus informes anuales sobre comercio ilegal (26 confiscaciones de 8.959 kg y 2 piezas de especímenes de *O. lanceolata*, todos comunicados en 2021).

8. A tenor de las cadenas comerciales poco claras, la falta de trazabilidad, los informes generalizados de extracción y comercio ilegales y los problemas de observancia, la Secretaría presentará esta cuestión a la atención del Comité Permanente.

Consultas con los Estados del área de distribución y compilación de información

9. De conformidad con el párrafo 1) d) ii) de la Resolución Conf. 12.8 (Rev. CoP18), sobre *Examen del comercio significativo de especímenes de especies del Apéndice II,* la Secretaría encargó al Centro de Monitoreo de la Conservación Mundial del Programa de las Naciones Unidas para el Medio Ambiente (PNUMA-CMCM) que compilase un informe sobre la biología, la gestión y el comercio de las especies seleccionadas en la PC26, para someterlo a la consideración del Comité de Flora en la presente reunión. Al hacerlo, el PNUMA-CMCM participó activamente con los Estados del área de distribución y los especialistas pertinentes en nombre de la Secretaría en la compilación del informe.

10. El informe sobre las especies del PNUMA-CMCM se encuentra en el Anexo 2 de este documento. En él se presentan las conclusiones sobre los efectos del comercio internacional sobre las especies seleccionadas, la base sobre la que se formularon esas conclusiones, así como los problemas en la aplicación del Artículo IV de la Convención. En él se proporciona una categorización preliminar de cada combinación especie/país en una de las tres categorías enunciadas en el párrafo 1 e) de la Resolución Conf. 12.8 (Rev. CoP18), a saber:

    a) ‘se necesitan medidas’ incluirá las combinaciones especie/país para las que la información disponible indica que no se están aplicando las disposiciones de los párrafos 2 a), 3 ó 6 a) del Artículo IV;

    b) ‘estado desconocido’ incluirá las combinaciones especie/país para las que la Secretaría (o los consultores) no pueda determinar si se están aplicando o no esas disposiciones; y

    c) ‘preocupación menor’ incluirá las combinaciones especie/país para las que de la información disponible parece desprenderse que esas disposiciones se están aplicando.

11. La Secretaría está de acuerdo con las categorizaciones provisionales presentadas en el informe en el Anexo 2, que se resumen en el siguiente cuadro. Los Estados del área de distribución que respondieron a la consulta se indican en **negritas.**

Especie	País	Categorización provisional en el Anexo 2
Dalbergia melanoxylon	Mozambique (MZ)	Se necesitan medidas
	República Unida de Tanzanía (TZ)	Estado desconocido
Dalbergia tucurensis	**Nicaragua (NI)**	Se necesitan medidas
Guibourtia tessmannii	**Camerún (CM)**	Se necesitan medidas
	Guinea Ecuatorial (GQ)	Se necesitan medidas
Osyris lanceolata	**Burundi (BI)**	Se necesitan medidas
	Etiopía (ET)	Se necesitan medidas
	Uganda (UG)	Depende de la publicación anual de un cupo de exportación nulo. Preocupación menor
	República Unida de Tanzanía (TZ)	Depende de la publicación anual de un cupo de exportación nulo. Preocupación menor
Aquilaria crassna	Viet Nam (VN)	Preocupación menor
Aquilaria malaccensis	**Indonesia (ID)**	Se necesitan medidas
	Malasia (MY)	Se necesitan medidas
Gyrinops spp.	**Indonesia (ID)**	Siempre que Indonesia acuerde especificar que los cupos de exportación para *Gyrinops* spp. se refieren a derivados de trozas en descomposición de las Regencias de Mappi y Asmat, y acuerda publicar anualmente un cupo de exportación nulo para cualquier otra extracción silvestre. Preocupación menor.
	Papua Nueva Guinea (PG)	Se necesitan medidas

12. Para los 14 casos revisados, 9 se han categorizado provisionalmente como “se necesitan medidas”; y 4 “preocupación menor”, señalando que 3 de estos casos sólo se categorizarían como “preocupación menor” con la publicación anual de un cupo de exportación nulo. Una caso se ha categorizado provisionalmente como “estado desconocido”.

13. De conformidad con el párrafo 1 f) de la Resolución Conf. 12.8 (Rev. CoP18), la Secretaría señalará a la atención de los Estados del área de distribución pertinentes el Anexo 2 de ese documento antes de la presente reunión y los invitará a que proporcionen información adicional para su consideración por el Comité de Flora.

Categorización y recomendaciones del Comité de Flora

14. De conformidad con los párrafos 1 g) e i) de la Resolución Conf. 12.8 (Rev. CoP18), el Comité de Flora, en la presente reunión:

    a) examinará las repuestas de los Estados del área de distribución que figuran en el Anexo 1 y el informe del PNUMA-CMCM en el Anexo 2, junto con cualquier información adicional recibida de los Estados del área de distribución concernidos. Según proceda, el Comité de Flora revisará la categorización preliminar propuesta para las combinaciones especie/país en los casos de ‘estado desconocido’, en los casos en que ‘se necesitan medidas’ o en los casos de ‘preocupación menor’, y aportará una justificación de la revisión;

    b) en los casos en los que ‘se necesitan medidas’, formulará, en consulta con la Secretaría, recomendaciones limitadas en el tiempo, factibles, medibles, proporcionales y transparentes dirigidas a los Estados del área de distribución retenidos en el proceso de examen, utilizando los principios esbozados en el Anexo 3 de la Resolución Conf. 12.8 (Rev. CoP18). Las recomendaciones deberían tratar de fomentar la capacidad a largo plazo del Estado del área de distribución para aplicar el Artículo IV, párrafos 2 (a), 3 y 6 (a) de la Convención; y

    c) tomará también en consideración, según proceda, la orientación sobre la formulación de recomendaciones para el Examen del comercio significativo, presentadas en el Anexo 3 del presente documento (originalmente publicadas como Anexo 5 del documento CoP17 Doc. 33).

15. De conformidad con el párrafo 1 g) i) de la Resolución Conf. 12.8 (Rev. CoP18), en los casos en los que el Comité de Flora categorice la combinación especie/país como de ‘menor preocupación’ debido al establecimiento de un cupo de exportación nulo, el Estado del área de distribución debería comunicar cualquier cambio en ese cupo a la Secretaría y la Presidencia del Comité de Flora, junto con una justificación.

16. De conformidad con el párrafo 1 i) de la Resolución Conf. 12.8 (Rev. CoP18), el Comité de Flora formulará recomendaciones separadas dirigidas al Comité Permanente para los problemas identificados durante el examen que no estén directamente relacionadas con la aplicación del Artículo IV párrafo 2(a), 3 o 6(a), siguiendo los principios esbozados en el Anexo 3 de la resolución.

17 En lo que concierne a la formulación de recomendaciones para los casos en los que “se necesitan medidas”, el Comité de Flora puede desear considerar factores como la naturaleza y la severidad del riesgo para las especies como resultado del comercio concernido, así como la capacidad del Estado del área de distribución para aplicar esas recomendaciones. Las recomendaciones deberían centrarse en los requisitos de la Convención y no ir más allá. Como se indica en la Resolución Conf. 12.8 (Rev. CoP18), las recomendaciones deben ser proporcionales y factibles, así como limitadas en el tiempo, medibles y transparentes. Debería alentarse también a los Estados del área de distribución a hacer uso de la nueva *Orientación sobre la formulación de dictámenes de extracción no perjudicial (DENP)* desarrollada en las Decisiones 19.132 a 19.134.

Recomendaciones

18. Se invita al Comité de Flora a:

    a) tomar nota de los casos finales confirmados tras la CoP19, de conformidad con el párrafo 4 (columnas A y B); y

b) emprender las tareas enunciadas en los párrafos 14 a 17, de conformidad con los párrafos 1 g) e i) de la Resolución Conf. 12.8 (Rev. CoP18).

Taxon/country combinations selected for review by the Plants Committee following CoP19:

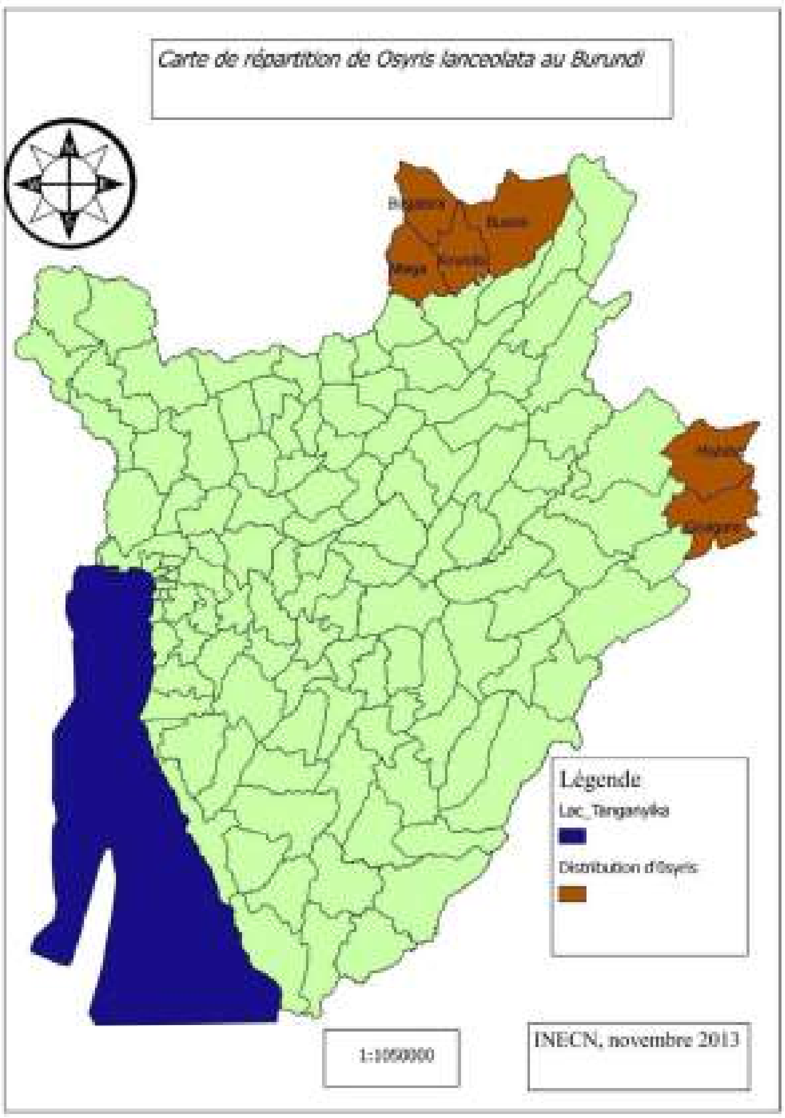
Range State responses

This document only includes the responses received for the taxon/country combinations that UNEP-WCMC was asked to review by the CITES Secretariat. Confidential information relating to CITES permits has been removed.

Contents

1. **L'aire de répartition, y compris la zone d'occurrence et la surface d'occupation de l'espèce *O. lanceolata* si disponibles, dans les forêts, plantations et aires protégées du Burundi.**

Selon l'étude l'INEC/actuel OBPE (***2013), l****'*espèce de bois de Santal-Est africain (*O. lanceolata*) était très remarquable dans la région Naturelle de Bugesera surtout en communes de Busoni, Bugabira et Kirundo, mais on observe quelques pieds en commune de Ntega. La zone altimétrique des populations est comprise entre 1380 m (Murambi) à 1612 m (Murore). *Osyris lanceolata* a été également observé à l'Est du Burundi en commune de Gisagara et Mishiha en Province de Cankuzo. Récemment (***2023)***, l'OBPE lors de l'étude d'identification du **paysages protégés de Kibimbi-inanzerwe, a identifié des pieds de l'***Osyris lanceolata à Inanzerwe au sud-est du Burundi à Makamba.*



2. **La taille, l'état et les tendances des populations de l'espèce *O. lanceolata* du Burundi.**

La taille, l'état et les tendances des populations de l'espèce *O. lanceolata* du Burundi n'est pas connu.
En effet il n'y a jamais eu d'inventaire complet de l'espèce *O. lanceolata* sur tout le territoire national du Burundi. Les données disponibles ne concernent qu'une étude d'exploitation d'*Osyris lanceolata* en province de Kirundo (2013) sous le financement de la Compagnie Franklin Investment LLC (FI LLC) dans le cadre d'un mémorandum d'accord mutuel signé entre ces deux institutions.
Cet accord avait ouvert à une anarchie notoire dans l'exploitation de l'espèce et son état de lieu sur sa répartition actuelle n'est pas connu (*les données de cette étude de références ont été considérablement modifiées), l'espèce a subie de fortes pressions qui ont fortement modifié son statut.*

3. **Les menaces pesant sur l'espèce (et toutes mesures mises en oeuvre pour atténuer ces menaces)**

Le danger d'extinction de cette espèce a longtemps été constaté par l'autorité d'alors lorsqu'elle a institué une Ordonnance du Rwanda Urundi N°29/129 du 27 avril 1923 relative à la coupe du bois de santal. Cette Ordonnance interdisait d'effectuer des coupes de bois de santal sans une autorisation spéciale émanant de l'autorité compétente (Résident) dans toute l'étendue des forêts appartenant au domaine ou à des communautés indigènes.

La forte demande d'huile de bois de santal et l'accès restreint aux sources traditionnelles en raison du déclin des populations des espèces de *Santalum*, ont conduit à l'identification d'*Osyris lanceolata* comme un remplaçant valable. Depuis lors, une course effrénée a été observée vers les pays d'origine et une surexploitation de cette plante est actuellement signalée dans les Etats propriétaires.
Le Burundi n'a pas échappé à cette surexploitation d'une essence dont la zone de répartition est restreinte. La dépression de Bugesera est actuellement le théâtre du commerce clandestin et des saisies de plusieurs tonnes des produits de cette plante ont été opérées. Depuis, les premières informations sur l'exploitation commerciale clandestine au Burundi ont commencé à circuler en 2010. Depuis Mars 2012, l'INECN/Actuel OBPE a mené les premières investigations sur l'exploitation clandestine de cette plante en région de Kirundo. Les investigations jusqu'là menées renseignaient qu'il existait des Tanzaniens bien organisés qui venaient acheter cette plante auprès des communautés locales. Plusieurs peuplements de cette plante ont été alors clandestinement déracinés dans les agroécosystèmes et dans la Réserve Intégrale de Murehe.
A cette période, plusieurs saisies ont été opérées et plus de 30 tonnes avaient était retenus dans les enceintes de la Police de Sécurité publique à Kirundo (Fig. 9). Des commerçants clandestins Burundais et tanzaniens ont été toujours punis par emprisonnement et versement des amendes avant leur lâchement.
Par la suite la course au commerce clandestin de cette plante proliférait avec vitesse inquiétante et cela avec l'implication des plusieurs personnalités et des communautés locales.
Selon cette étude de 2013 plusieurs personnes et organisations nationales locales ont commencés à s'y mêler et plusieurs demandes de permis d'exploitation de cette plante en danger ont été déposées à l'INECN.

Le document d'étude note que dans le souci d'assurer une exploitation légalisée, une analyse des procédures de la CITES dans de tel commerce a été faite. Il a fallu également interroger la Convention sur la Diversité Biologique pour trouver des orientations afin d'entamer des négociations.

Le prélèvement du bois impliquait le déracinement d'*Osyris lanceolata* pendant la nuit et les produits de déssouchage sont parfois cachés en tas dans les coins du lieu d'exploitation. Ces produits traversaient les frontières des pays voisins et le transport se faisait la nuit par des camions de manière frauduleuse. Les vélos étaient utilisés dans le ressamblage de différents produits dispérsés dans les lieux d'exploitation.

Dans cet état et à la suite de son déracinement excessif (qui en constitue la principale menace) pour son exportation clandestine, la Stratégie Nationale et Plan d'Action sur la Biodiversité *met en relief que* le prélèvement excessif d'*Osyris lanceolata* l'a réduit considérablement.

4. **Les détails de comment l'espèce est utilisée, par ex. quelles parties et quels dérivés sont le plus important commercialement ? Y a-t-il un marché intérieur ainsi qu'international pour l'espèce ? Y a-t-il des données disponibles sur les volumes de commerce intérieur ?**

Au Burundi, *Osyris lanceolata* participe dans peu d'usages. Selon les personnes enquêtées (au cours de l'étude de 2013 qui est la seule référence sur l'espèce au Burundi), ce petit arbruisseau est utilisé comme plante médicinale traitant les maladies des petits enfants (Igikoko) comme purgatif. Cette espèce est également utilisée comme, bois de chauffage et, quelques fois, bois de construction. Les petites branches sont utilisées pour griller les brochettes dans des cabarets car elles résistent au feu.

L'arbre est exploité pour ses huiles essentielles aromatiques que l'on trouve dans son duramen. L'huile essentielle se trouve dans le duramen et les branches mais se concentre surtout dans les racines. La plante entière est donc déracinée pour prélever les racines et parfois les tiges. Celles-ci sont écorcées, coupées en petits morceaux et emballées dans des sacs de jute pour faciliter le transport et dans la plupart des cas les faire passer pour du bois de chauffage.

Le bois de santal est un patrimoine national d'intérêts incontestables. Actuellement, seuls les exploitants clandestins bénéficient des avantages découlant de l'exploitation de cette ressource. Même les communautés locales propriétaires de la ressource vendent leurs produits à un prix qui n'est pas bien connu et certainement très faible. Pourtant, les bénéfices issus de l'utilisation d'*Osyris lanceolata* doivent être partagés par toutes les parties prenantes.

Le commerce d'*Osyris lanceolata* nécessite un contrôle et suivi rigoureux pour éviter la surexploitation de l'espèce. Cela implique la collaboration étroite entre l'Institut National pour l'Environnement et la Conservation de la Nature (INECN), les différentes parties prenantes.

- **Communautés locales propriétaires d'*Osyris lanceolata* dans les agroécosystèmes**
- **Communes en tant que proriétaires des boisements communaux**

- **Associations nationale et locales travaillant dans la conservation de l'Environnement**

- **Forces de sécurité, agents de la PAFE et de douanes et la police anticorruption**
- **Institut National pour l'Environnement et la Conservation de la Nature**
- **Office Burundais de Recettes (OBR)**
- **Administration locale**

Pour la vente des produits issus de l'exploitation **d'*Osyris lanceolata au Burundi,*** un mémorandum d'accord mutuel avait était signé entre l'INEC/ actuel OBPE et la FI LLC : une Compagnie Internationale ayant son siège en Florida, U.S.A., engagée dans la production et la commercialisation des produits pharmaceutiques, médicaux et cosmétiques, et dans d'extraction des huiles essentielles et des composants aromatiques à base des plantes (arbres, arbustes et herbes) sauvages et agricoles et à travers des procédés industriels. L'objectif des deux parties prenantes d'exploitation durable de certaines plantes autochtones du Burundi et, pour le cas de cette étude, d'assurer une valorisation rationnelle d'*Osyris lanceolata* et un partage juste et équitable des avantages qui en découlent pour toutes les parties prenantes avait échoué.

Réellement il n'y a pas eu d'inventaires complets sur toutes les zones du territoire national susceptibles d'abriter *Osyris lanceolata* et jusqu'alors il n'y pas de projet ni de plans ni de programme pour réaliser cet inventaire.
Ceci constitue un défi limitant pour la bonne gestion de cette espèce en danger au Burundi, l'OBPE a la conscience de cette situation et reconnaît qu'il est important normalement de savoir ce qu'on a pour prévoir la bonne gestion.

5. **La réglementation de la récolte et du commerce de source sauvage (par ex. quotas de récolte légale, quotas d'exportation, diamètres minimums de coupe, période de rotation, et plans de gestion), y compris les détails de toute concession en activité. Nous vous serions reconnaissants de fournir des copies de toute législation pertinente.**

La réglementation concernant la protection de l'espèce avait été mis en place dès 1923, notamment par Ordonnance du Rwanda Urundi N°29/129 du 27 avril 1923 relative à la coupe du bois de santal. Cette Ordonnance interdisait d'effectuer des coupes de bois de santal sans une autorisation spéciale émanant de l'autorité compétente (Résident) dans toute l'étendue des forêts appartenant au domaine ou à des communautés indigènes.
D'autres textes légaux, bien que ne visant pas directement *Osyris lanceolata,* concourent pourtant à sa conservation. En effet, l'article 7de la loi n°1/10 du 30 Mai 2013 portant création et gestion des aires protégées au Burundi précise que sans préjudice des dispositions du Code de l'Environnement relatives à la protection des espèces animales ou végétales, sont intégralement protégées, à tous les stades de leur cycle biologique, les espèces végétales:
1) considérées comme menacées par les Conventions internationales;
2) considérées comme menacées au Burundi par l'organisme gestionnaire des aires protégées.

Cette protection implique l'interdiction de:

1) couper, déraciner ou détruire intentionnellement des spécimens de ces espèces dans la nature ;
2) détenir, transporter, vendre ou acheter des spécimens de ces espèces prélevées dans la nature, sous réserve des exceptions établies en application de la législation forestière ;
3) détériorer ou détruire intentionnellement les habitats naturels dans lesquels la présence de ces espèces est établie.

Le Code de l'environnement à travers l'article 88 prévoit que la préservation de la diversité biologique, la reconstitution des écosystèmes dégradés et la régénération des espèces animales et végétales menacées ou en voie de disparition constituent une obligation incombant à l'Etat, aux collectivités locales et aux personnes privées, physiques ou morales.
Le même Code ajoute à travers l'article 89 que les espèces animales et végétales ainsi que leurs milieux naturels doivent être protégés et régénérés au moyen d'une gestion rationnelle en vue de préserver ces espèces et leur diversité.
Enfin, l'article 90 du même Code interdit ou soumet à l'autorisation préalable toute activité susceptible de porter atteinte aux espèces animales ou végétales menacées, en voie de disparition, rares ou remarquables, ainsi qu'à leurs milieux naturels.

De plus, le Burundi a ratifié la Convention sur la Diversité Biologique (CDB) en 1997. Par cet acte, il est obligé de mettre en oeuvre toutes ses dispositions en l'occurrence l'objectif 3 relatif à l'Accès et Partage des Avantages découlant de l'utilisation des ressources biologiques. L'article 15 de cette convention prévoit des mécanismes d'accès aux ressources biologiques et/ou génétiques d'un pays et de partage des avantages découlant de leur utilisation. Conformément à cette convention, le pays est appelé à mettre en place des conditions préalables avant l'accession à ces ressources en vue de son exploitation et sa commercialisation.
Ces ressources sont un composant stratégique pour plusieurs secteurs, en particulier les industries pharmaceutiques, cosmétiques, biotechnologiques et agro-alimentaires et la recherche académique dont les missions de bioprospection se déroulent souvent dans les pays en développement.
Toutes les nations du monde viennent de se réunir à Nagoya au Japon dans le cadre de la 10ème Conférence des parties de la Convention sur la Diversité Biologique ont adopté le Protocole de Nagoya sur l'accès et le Partage des avantages découlant de l'utilisation des ressources génétiques et les connaissances traditionnelles y afférentes. Ce protocole relatif à la convention sur la CDB a pu mettre en place des dispositions d'accès et de partages des avantages découlant de l'utilisation des ressources génétiques.

Ces avantages monétaires (Paiements des redevances, Droits de licence en cas de commercialisation, droits spéciaux, financement de la recherche, copropriété des droits de propriété intellectuelle, etc) et non monétaires (Partage des résultats de la recherche, Renforcement des capacités en matière de transfert des technologies et des capacités institutionnelles, Formation, etc) sont prévues par le Protocole. L'accès clandestin à ces ressources pourra faire perdre aux pays ces différents profits. Ce qui prouve que cette exploitation clandestine est à arrêter.

Quota annuel d'exploitation à autoriser sur une base rationnelle en province de Kirundo

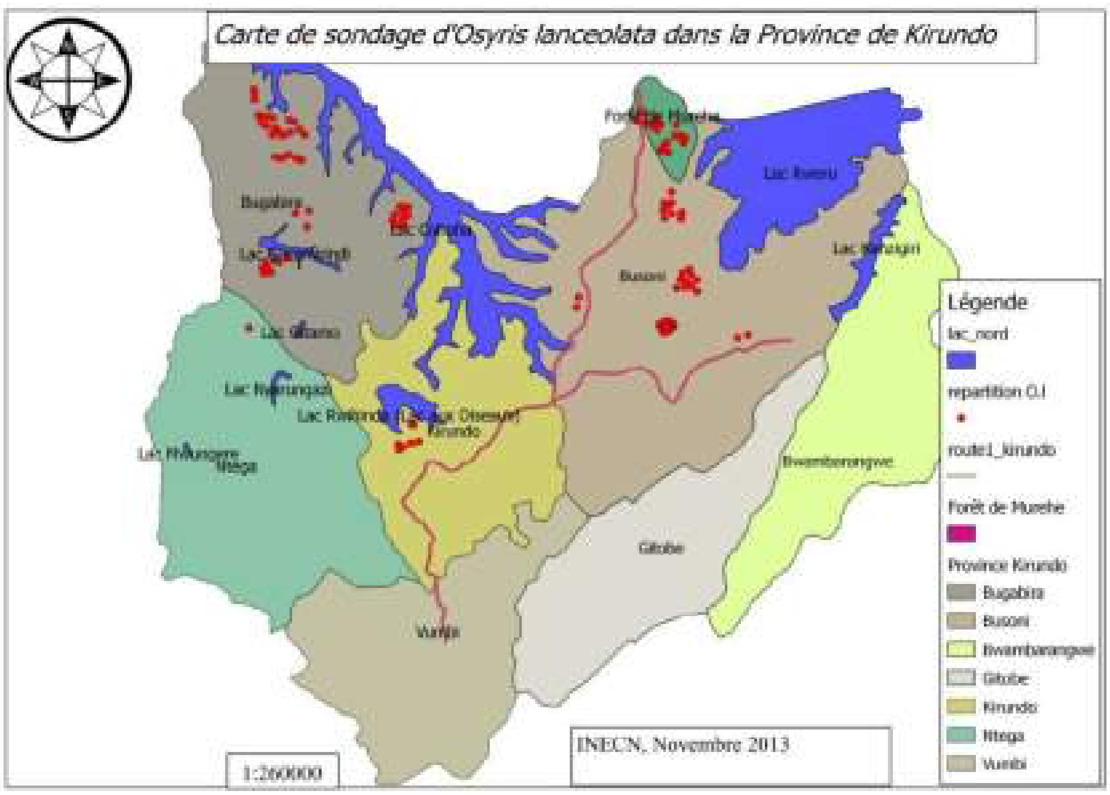
L'étude proposait que que le stock de Kirundo ne peut être exploité que si la garantie d'épuiser le stock estimé dans 15 ans est sûre. Cela accroît la probabilité de trouver encore *Osyris lanceolata* en quantité suffisante pour une autre phase de 15 ans d'exploitation.

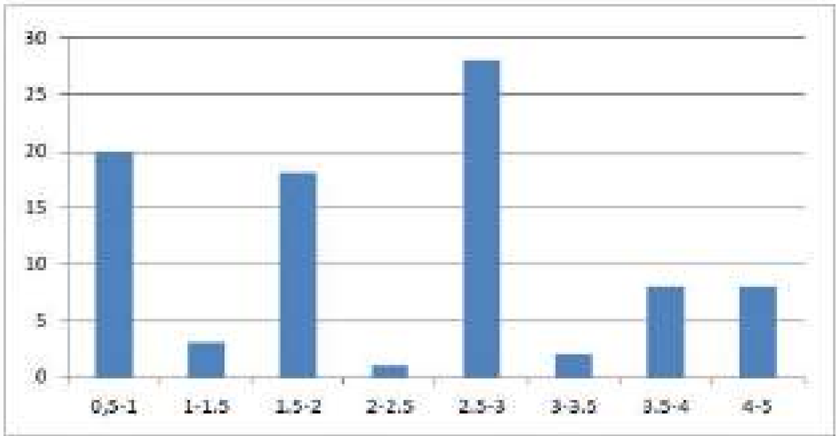
Dans le souci d'optimiser l'exploitation rationnelle, il faut considérer que ces individus exploités illégalement contiennent encore des plantes n'ayant pas encore atteint l'âge d'exploitation. La décision prise est donc de soustraire dans le calcul le poids de tous individus n'ayant pas encore 20 kg. De plus, le poids des individus de grandes tailles est également exclu du fait qu'il s'agit des arbustes rares. Ainsi, les 29 individus ayant moins de 20 kg et les 2 individus ayant plus de 120 kg vont avoir comme poids égal à zéro. Cela élimine leur influence dans l'augmentation du poids. Toutes ces considérations font aboutir à un poids total à retenir égal à 3623 kg. La productivité d'un individu exploitable d'*Osyris lanceolata* est donc de 36 kg.

6. **Des informations sur les tailles et structures des populations dans les zones de récolte (y compris si des inventaires ou un suivi de l'espèce ont été/sont réalisés, et le cas échéant, des détails concernant ces inventaires : par ex. les concessions, la surface, le nombre d'individus recensés, les résultats de la structure de la population y compris le nombre d'individus dans chaque classe de taille de diamètre). Si des inventaires n'ont pas lieu, y a-t-il des plans pour en réaliser ?**

En analysant la distribution des hauteurs des individus recensés dans les bosquets de Muhere, on constate une évolution désquilibrée de l'espèce (Fig. 6). Cela est lié au fait que dans cette aire protégée, il y a des coupes sélectionnées préférant souvant certains âges de cette plante pour divers usage.

Respectivement : carte de la zone d'étude et distribution des individus d'*Osyris lanceolata* par classe de hauteurs





7. **Les détails de comment les avis de commerce non-préjudiciable CITES (ACNP) sont établis, ainsi que les institutions impliquées dans ces décisions**

Pour le cas précis du Burundi en particulier, la mise en œuvre efficace de ces décisions nécessite un bonne maîtrise d'informations relatives à la gestion et le contrôle du commerce international de l'espèce. Ces informations devraient être transmises régulièrement au Secrétariat CITES et au centre mondial de surveillance de la conservation de la nature (WCMC) par les organes de gestion CITES, (l'INECN en ce qui concernait le Burundi). La transmission de ces informations serait faite sous forme de rapport bisannuel conformément aux dispositions de l'article VIII paragraphe 7 alinéa b) de la convention. Ainsi, le rapport sur les travaux demandé par la conférence des parties dans la décision 16. 153 envisagé pour la 17ème session de la conférence des parties (prévue en 2016) aurait été possible.
En ce qui concerne l'avis de commerce non préjudiciable (ACNP), l'autorité scientifique de (INECN) aurait dû bénéficier d'un renforcement des capacités. En effet, généralement les autorités scientifiques éprouvent souvent des difficultés lorsqu'elles sont appelées à émettre un avis de commerce non préjudiciable à l'intention des organes de gestion. L'ACNP répond aux exigences de l'article IV de la convention.
Selon l'article IV, l'autorité scientifique doit établir que les exportations proposées ne nuiront pas à la survie de l'espèce. En outre lorsqu'il s'agit d'exportations en cours, l'autorité scientifique doit surveiller les exportations réelles afin de garantir que, dans toute son aire de répartition, l'espèce se maintient à un niveau conforme à son rôle dans l'écosystème et nettement supérieur à celui qui entraînerait son inscription à l'annexe I. En pratique, l'autorité scientifique aurait dû évaluer le niveau total du prélèvement à l'échelle nationale tant pour les nouvelles exportations que pour les exportations en cours afin de pouvoir émettre un ACNP (Rosser et *al*., 2002).
En principe, « l'exportation pour le commerce international n'est pas préjudiciable lorsqu'elle s'intègre dans un prélèvement globalement durable en ce qu'elle n'entraîne pas de réduction imprévue de l'aire de répartition ou de déclin à long terme de la population ou d'autres changements dans la population susceptibles d'entraîner l'inscription de l'espèce à l'annexe I».

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Application de la Résolution Conf 12.8 (Rev.COP 18), étude du commerce important de Guibourtia tessmmanii, espèces inscrites à l'annexe II de la CITES.

RÉACTION DU CAMEROUN

(ANAFOR, Juillet, 2023)

Contents

INTRODUCTION

En sa 26e session, tenue à Genève (Suisse) au mois de juin dernier, le Comité des Plantes de la CITES a sélectionné *Guibourtia tessmannii (BUBINGA ROSE) origine Cameroun*, dans le Binôme /Pays pour l'étude du commerce important. Conformément à la Résolution Conf 12.8 (Rev.COP 18), une correspondance en date du 19 juin 2023 de l'Unité scientifique du Secrétariat de la CITES a été adressée au Cameroun a titre d'information et de requête. Il est attendu du Cameroun de fournir la base scientifique de fixation des quotas annuels d'exportation de cette espèce de BUBINGA (Bubinga rose) afin de devoir justifier l'application de l'art 4.2(a) de la CITES portant sur les Avis de Commerce Non Préjudiciable (ACNP) de cette espèce. A cette étape de l'étude, cette enquête a principalement pour but d'obtenir les informations nécessaires pour évaluer l'application de l'Article IV, paragraphes 2 (a), 3 et 6 (a) concernant les exportations de *Guibourtia tessmannii* en provenance du Cameroun. Selon la résolution, les Etats de l'aire de répartition choisis ont 60 jours (au 19 août 2023) pour répondre à cette enquête. Il est important de respecter les "

II RAPPELS

Le Cameroun compte quatre espèces d'arbres du genre *Guibourtia* (Fabaceae/Leguminosae-Detarioideae) à savoir: *Guibourtia demeusei* (Harms) J.Léonard, *G. ehie* (A.Chev.) J.Léonard *G. pellegriniana* J.Léonard *et G. tessmannii* (Harms) J.Léonard. Trois sont appelées de la dénomination de nom pilote ou commercial Bubinga. Elles sont distinguées au Cameroun sous les appellations communes suivantes : bubinga rouge (*G. demeusei*) et bubinga rose (*G.*

pellegriniana et *G. tessmannii*). Des questions en rapport avec la surexploitation des ces trois espèces d'arbres ont été relevées ces 10 dernières années, des quantités importantes des produits à base de ces trois espèces ayant été exportées en Asie et en Europe. Parmi ces trois espèces, *Guibourtia tessmannii et Guibourtia pellegrinia* se caractérisent par des similitudes morphologiques remarquables qui compliquent singulièrement la différenciation des arbres des deux espèces et de leurs bois respectifs. Leurs populations sont disséminées en densités relativement faibles (généralement inférieures à 0,05 pieds/ha) dans des aires de répartition étroites se chevauchant à travers trois pays d'Afrique centrale (Gabon, Cameroun (Sud, Centre et Est), Guinée équatoriale). La dénomination commune Bubinga désigne également l'espèce *Guibourtia demeusei*, davantage inféodée aux forêts inondables(4). Son aire de répartition est plus importante et s'étend jusqu'à la cuvette du Bassin du Congo, où elle peut former de petits peuplements. Bien que son arbre et son bois présentent des spécificités qui permettent davantage de les identifier, son bois bien que de moindre qualité que celle des deux autres espèces est également confondu avec celui de *G.tessmannii et de G.pellegrinia* sur les marchés internationaux des bois tropicaux, où il est également communément dénommé Bubinga. La densité du Bubinga rose pour les mêmes classes de diamètre et les mêmes types de forêts est très faible, soit 0,02 tiges/ha. La distribution des tiges par classe de diamètre montre des structures diamtériques régulières en J renversé, témoignant globalement d'une bonne régénération pour les deux Bubinga dans tous les types de forêts considérés.

Appréciés pour leurs qualités esthétiques, les bois de Bubinga sont commercialisés sur les marchés internationaux des bois tropicaux depuis la première moitié du 20ème siècle. Les exportations de grumes, ont atteint des volumes annuels de l'ordre de 15.000 m3 au Cameroun (1998), ont significativement réduit les populations des espèces concernées dans leurs aires de répartition respectives. Au cours des dix (10) dernières années, la valeur du bois des espèces de Bubinga s'est fortement appréciée sur les marchés internationaux en raison de l'augmentation de la demande chinoise. Les prix de ces bois précieux, qui comptaient déjà parmi les plus élevés, ont connu une appréciation supplémentaire exponentielle, de l'ordre de 300 à 500% selon les qualités et spécification. En ne respectant pas les exigences de durabilité des codes forestiers en vigueur dans ces pays, ces filières fragilisent encore davantage les populations des espèces concernées et risquent de conduire rapidement à des disparitions au niveau local. Conformément à l'Article II, paragraphe 2(a) de la Convention et à la Résolution Conf. 9.24 (Rev. CoP16), Annexe 2 (a), paragraphe B. Au cours des travaux de la session de la COP(17), un consensus fut établi au sujet du Bubinga portant sur la nécessité d'établir une réglementation du commerce de cette espèce pour faire en sorte que le prélèvement de ses spécimens dans la nature ne réduit pas la population sauvage à un niveau auquel sa survie pourrait être menacée par la poursuite du prélèvement ou d'autres influences. Les essences forestières *G. tessmannii*, *G. pellegriniana* et *G. demeusei* ont été inscrites dans l'Annexe II de la Convention sur le commerce international des espèces de faune et de flore sauvages menacées d'extinction, lors de la dix-septième session de la Conférence des Parties de ladite convention (CoP17).L'inscription du Bubinga sur l'annexe II de la convention CITES est accompagnée d'une annotation qui indique que le commerce international des parties, à l'exception des feuilles, fleurs, pollens, fruits et graines, et tous les produits bruts et transformés est également réglementé par ladite Convention

Guibourtia tessmannii

Medium-sized to large tree up to 40 m tall; bole branchless for up to 20 m, straight, cylindrical, up to 200 cm in diameter and often with large, slender buttresses up to 3 m high; *G. tessmannii* is very large trees, among the largest in the primary forest reaching 60 cm in height and 200 cm in diameter (Souane 1985, Meunier *et al.* 2015) and often with large, slender buttresses up to 3 m high Diameter of *G. tessmannii* can reach big size than that of *G. pellegriniana* (Doucet cit. Cop17, Prop 56) Crown is umbelliform, sometimes parasol, dense, with sinuous branches, upright (Souane 1985, Tailfer 1989, Leemens *et al.* 2012). Bole of *G. tessmannii* is straight, cylindrical, sometimes channelled, short; thin, high, without branches on 20 m and with irregular long and plank-buttresses which can reach 3 m (Leemens *et al.* 2012). The bark surface greenish grey to reddish brown, rough, scaly, flaking off in small circular patches leaving bright red depressions. Blaze about 1 cm thick; slash dark pink, granular, brittle. According to Tailfer (1989), the slash of *G. tessmannii* (same as *G. pellegreniana*) is brownish-red, fibrous inside, and producing a gelatinous **gum redcurrant** (but yellow clear for *G. pellegreniana*); according to Meunier et al. (2015) the slash of *G. tessmannii* is brownish-pink, giving a reddish gum (againt yellow clear for *G. pellegreniana ; and for* (Souane (1985), Leemens *et al. (*2012) The slash of *G. tessmannii* is brownish-pink, giving a reddish gum gelatinous, **red exudate sap**. The bark of the base of the bole is often removed for medicinal uses (see below uses).

Leaves are alternate, compound one foliolate,. Petiole 1.5 to 3.5 cm long, glabrous, pulvinate at the apex and at the base. Leaflets 2, opposite, **sessile (Tosso et Al. 2015);** lamina(or blade) ovate-falciform, 2 to 15 cm by 3 to 6 cm, acuminate to abruptly cuspidate at the apex, cuneiform to acute and asymmetrical at the base, coriaceous, glabrous, **without translicid dots**. Midrib prominent on the under surface; 5 to 7 pairs of secondary nerves prominent beneath, camptodrome, Inflorescence an axillary or terminal panicle c. 10 cm long, with **thick branches**, reddish hairy; bracts small, very early caducous . bracts small, very early caducous. Flowers bisexual, nearly regular, whitish, fragrant, sessile; ovary subsessile and hairy. Pods shortly pedicellate, obliquely elliptic, straight on one side, convex on the other, 3 to 4 cm by 2 to 3 cm, thick, opening into 2 coriaceous valves, with a finely folded and striated surface. Fruit an obliquely ellipsoid pod 3–4 cm × 2–2.5 cm, slightly flattened, glabrous, densely striped, dark copper-brown, dehiscent with 2 leathery valves, 1(–2)-seeded. Seed kidney-shaped, c. 1.5 cm long, slightly flattened, completely covered by an **orange-red aril**.

Wood

The wood of *G. tessmannii* and *G. pellegreniana* is quite similar and difficult to distinguish. It is pinkish brown, finely veined with violet-red, hard, and heavy (Souane 1985, Tailfer 1989, Meunier *et al.* 2015).

The characteristics followings are apparently those of G. *tessmannii*, the main timber known as bubinga. The heartwood is reddish brown, often with violet-brown or purplish streaks, and distinctly demarcated from the whitish, up to 7.5 cm wide sapwood. The grain is straight or interlocked, texture fine and even. The wood is lustrous and scented when freshly cut.

The wood is heavy, with a density of 860–930 kg/m³ at 12% moisture content, and hard. It air dries slowly with high risk of distortion. The rates of shrinkage are quite high, from green to oven dry 5.2–8.1% radial and 6.3–10.5% tangential. At 12%

moisture content, the modulus of rupture is 166–195 N/mm², modulus of elasticity 15,100 N/mm², compression parallel to grain 66–73 N/mm², shear 9.5 N/mm², cleavage 20–27 N/mm and Chalais-Meudon side hardness 7.9–9.0.

The wood is fairly easy to saw and work with both machine and hand tools, and it planes to a good finish. It polishes well and varnishes satisfactorily. It holds nails well and has good gluing properties. Good-quality veneer can be produced by slicing. The wood is durable and resistant to termites, Lyctus and other wood-boring beetles. The heartwood is resistant to impregnation with preservatives, the sapwood moderately resistant.

The wood of Guibourtia tessmannii contains flavanols of leucofisetinidin and guibourtacacidin, tannins and sugars. Some stilbene glycosides have been isolated from the bark, as well as asebotin, a dihydrochalcone glucoside. Pharmacological screening showed antifungal activity.

Habitat and ecology

Guibourtia tessmannii occurs in evergreen forest, usually in primary forest on well-drained localities. *Guibourtia tessmannii* grows on compact soil. It is found in the evergreen atlantic forest in Cameroon (Vivien et Faure opcit., Souane opcit). Individuals grow on firm, well drained ground in lowland to hilly littoral forests (CoP17 Prop 56 2016). The species is light demanding and experiences non- gregarious growth. Forest cover is in decline within the Central African region, 4.6% of forest cover was lost between 1999 and 2012 (CoP17 Prop 56 2016). Within Cameroon deforestation has been identified as a particular threat to the species due to the expansion of agriculture (Betti 2012).

Production and international trade

The wood is traded as Bubinga. This is the main known and commercialized as Bubinga tree in Cameroon.

Genetic resources

Although Guibourtia tessmannii has a limited geographical distribution and usually occurs scattered in primary forest, there are no indications that it is under threat of genetic erosion at present. However, it is advisable to monitor populations because the species may easily become liable to genetic erosion.

Prospects

The wood of *Guibourtia tessmannii* is in demand on the timber market, but research is needed to be able to determine its possibilities for commercial exploitation on a sustainable basis. There is no information available on growth rates, propagation and planting, and suitable management measures. Slow growth has been reported for some other *Guibourtia* species, and could also be a serious drawback for *Guibourtia tessmannii* because long cutting cycles would be necessary for sustainable exploitation. The common application of the bark in traditional medicine warrants more research on phytochemistry and pharmacological properties.

For the anatomy see Encadré 1

Traditional uses

In traditional medicine, bark decoctions are administered for the treatment of gonorrhoea and hypertension, and for preventing abortion. They are also taken as an anthelmintic and applied as a cleanser for washing wounds. In the markets of Yaoundé (Cameroon), stem bark is for sale to cure many complaints: convulsions, diarrhoea, lumbago, hernia, malaria, anaemia and female infertility. A survey among villagers yielded claims that use of bark, leaves or fruits also controls typhoid fever, haemorrhoids, cancer, sexually transmittable diseases and hepatitis. Bark extracts are used in southern Cameroon as a pesticide, often in mixtures with other plant species, to control the 'black pod disease' in cacao cause by fungi. The bark is much sought after and has often been removed at the base of the bole of standing trees.

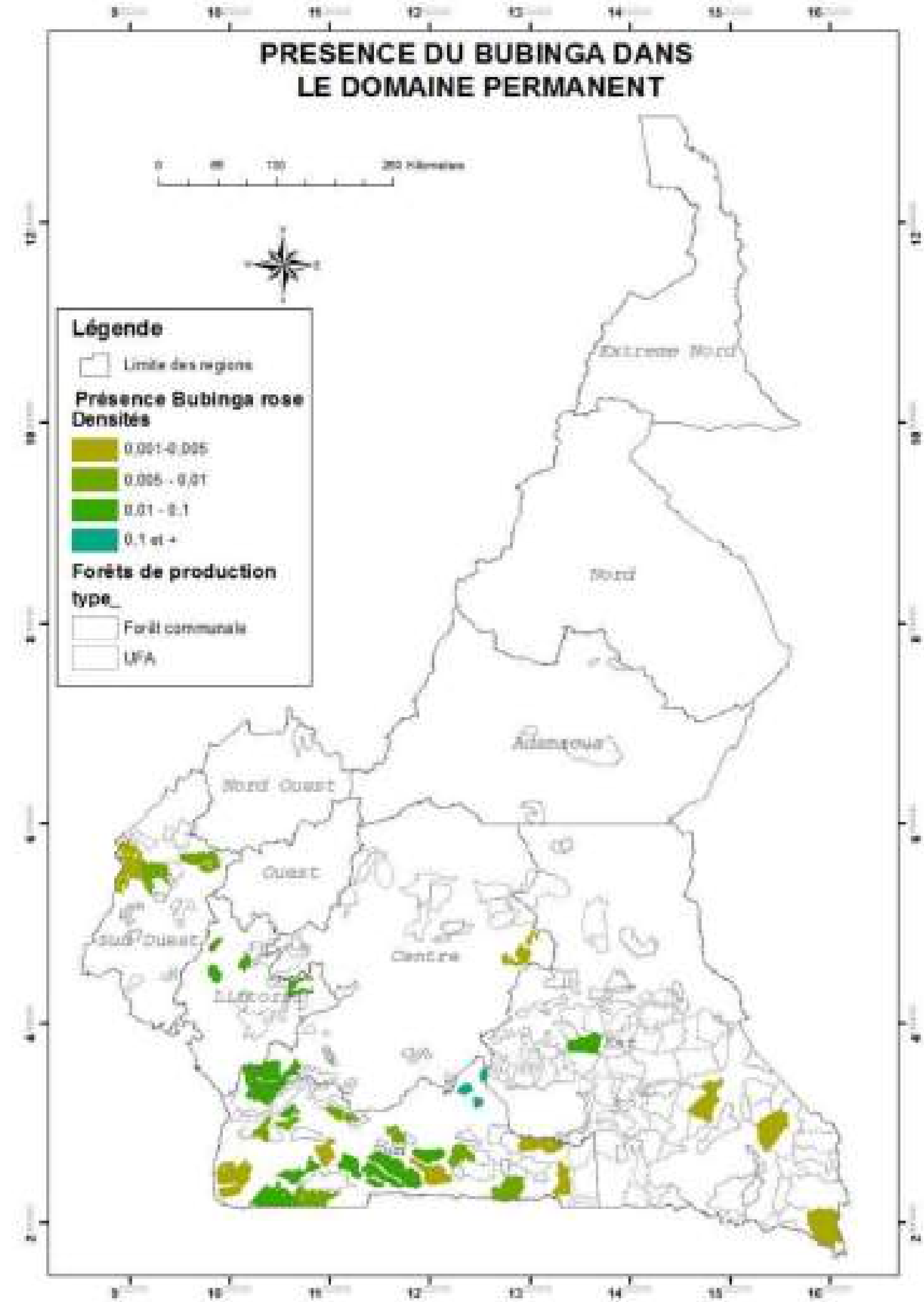

Figure.1: Density (occupancy) map of Pink Bubinga (*Guibourtia tessmannii/pellegreniana*) in Cameroon

Le Ministère des Forêts et de la Faune (MINFOF) en sa qualité d'Organe de Gestion (OG) CITES est chargé de porter à l'attention de la communauté internationale, à travers le site web de la CITES, l'information sur les propositions de quota national d'exportation et de l'attribution des volumes à exploiter, du suivi et du contrôle de toute la chaine d'exploitation. L'Agence Nationale d'Appui au Développement Forestier (ANAFOR) en sa qualité d'autorité scientifique CITES-Flore au Cameroun. Conformément aux dispositions de la CITES a la responsabilité de formuler sur la base des études scientifiques le document d'Avis de Commerce Non Préjudiciable (ACNP).

Une innovation majeure est survenue dans la formulation des ACNP au Cameroun. Le Cameroun, à la différence de nombreux Etats partie de l'aire de distribution, a introduit un Quota de récolte différent de la possibilité annuel de Coupe issue des inventaires d'exploitation. Le quota d'exportation de Bubinga étant défini sous la forme des débités, de plots ou de grume, le taux de conversion utilisé s'applique sur le quota de récolte. Ce qui réduit drastiquement le taux de déperdition de la ressource.

III-MODELÉ DE GESTION ET CALCUL DES QUOTAS AU CAMEROUN

III-1Modèle de gestion de Bubinga

Le présent modèle de gestion de Bubinga dans sa chaîne de valorisation forêt-usine de 1ère transformation permet de définir un benchmark national pour les diverses variables de performance de valorisation des pieds de Bubinga (au niveau de la récolte en forêt et de sa transformation en usine, et de ce fait de faire un benchmarking de chacune des entités intervenant dans la chaîne de valorisation en vue de fournir à l'Organe de Gestion CITES-Flore un outil de pilotage de Bubinga, soucieux de la recherche de la performance optimale dans sa valorisation par les divers intervenants. Le module informatique mettant en œuvre le présent modèle permet, en plus de calculer automatiquement les diverses grandeurs d'intérêt, aussi de réaliser diverses simulations en vue de la fixation des principales grandeurs de gestion de Bubinga : **Quotas de Récolte de pieds de Bubinga dans les Forêts** (au niveau de chaque titre et au niveau national) et **Quotas de débités de Bubinga** (au niveau de chaque usine et au niveau national).

3.1.1. Les principaux paramètres de gestion de la chaîne de valeur de Bubinga pris en charge par le modèle de gestion (et donc calculés dans le module informatique) sont :

a) **Le Tarif de Cubage actualisé** :

Il est spécifique à chaque titre « permanent » (UFA, Forêt Communale). Il est calculé selon une formule de régression linéaire par la méthode des moindres carrés, à partir des données, pour tous les pieds d'arbres récoltés au fil des années (à partir d'une année de référence), des volumes effectivement récoltés (variable dépendante) et des DHP correspondants (variable indépendante). Le modèle considère que chaque nouvelle année, l'échantillon de données est augmentée avec les nouvelles données de production forestière en vue d'une nouvelle actualisation du tarif de cubage.

b) **Le Quota de Récolte de Bubinga , pour une année donnée** :

Le quota de récolte, est défini sous la forme d'un volume de Bubinga . Le présent modèle considère un quota de récolte par UFA et un quota de récolte national :

c) **Le Quota de Récolte de Bubinga dans une UFA**

(pour le compte d'une année donnée) : Il prend en compte que dans une UFA en activité, deux AAC sont ouvertes à l'exploitation : une nouvelle AAC et l'AAC en cours d'exploitation au courant de l'année d'élaboration de la prévision du quota (année suivante donc). Ainsi, sur cette base, le modèle considère que pour une nouvelle année donnée, il devrait être déterminé pour chaque UFA (ou FCommunale) un **Quota de Récolte Total (QRT)** égal à la somme de :

i) un quota de récolte dans la nouvelle AAC (QR), calculé comme une fraction du potentiel de récolte (PR) dans la nouvelle AAC (potentiel déterminé à partir des résultats des inventaires d'exploitation dans la nouvelle AAC, en leur appliquant le tarif de cubage actualisé),

ii) éventuellement une fraction du Quota Résiduel dans l'AAC en cours (QRR).

3.1.2. Eventuellement une fraction du Potentiel de Récolte Résiduel

dans l'AAC en cours (PRR, calculé comme la différence). Le modèle mathématique présente les différentes formules pour le calcul de chacune de ces variables. À la suite du calcul de QRT, il est aussi déterminé pour l'année considérée (année suivante donc) le Potentiel de Récolte Résiduel Total (PRRT) laissé sur pied dans une UFA donnée ;

3.1. Le Quota de Récolte de Bubinga au niveau national (QRN) : Il est calculé comme la somme des QRT des UFA (et FC) identifiées par les usines (sollicitant des quotas de débités) comme leurs fournisseurs en grumes = de Bubinga. Il est aussi calculé un potentiel de récolte résiduel national comme la somme des PRRT des UFA (et FCommunale) « correspondantes »

IV- Le Taux de Transformation (TT) de Bubinga :

Il représente une grandeur permettant de qualifier la performance de valorisation de Bubinga d'un « couple » UFA(FC)-Usine. Le taux de transformation est calculé en considérant 03 « indicateurs » de performance : i) le rendement-matière de récolte des pieds de Bubinga , sur une base historique (RM réc., calculé comme le rapport de la somme des valeurs des volumes des pieds récoltés au fil des années et consignées dans les DF10 (à partir d'une année de référence) sur la somme des valeurs des volumes des mêmes pieds et pour les mêmes années tels qu'estimés avant leur récolte), ii) le rendement-matière de façonnage parc forêt des billes de Bubinga , sur une base historique (RMfac., calculé comme le rapport de la somme des valeurs des volumes des grumes transportées vers l'usine au fil des années et consignées dans les Lettres de Voiture (à partir d'une année de référence) sur la somme des valeurs des volumes récoltés des mêmes billes et pour les mêmes années tels qu'inscrits dans les DF10) et, iii) le rendement matière de transformation des grumes de Bubinga dans l'usine (RMusine), sur une base historique (calculé comme le rapport de la somme des volumes de débités produits tout au long des années (à partir d'une année de référence) sur la somme des volumes des grumes effectivement entrées en transformation au cours des mêmes années). Le « Taux de

Transformation » du Couple Usine-UFA (ou FC) est le produit de ces trois types de rendement.

IV 1-. Quota de Débités de Bubinga, pour une année donnée : Il est défini comme un volume de débités, autorisé à la commercialisation.

Le modèle développé cadre de la présente étude (et son module informatique) permet de déterminer un quota de débités autant au niveau d'une usine qu'au niveau national :

Le Quota de Débités au niveau d'une usine, pour une année suivante, prend en compte autant le quota de débités réalisable à partir de ses nouveaux approvisionnements que le « quota de débités résiduel » selon, i) le quota de débités pour les nouveaux approvisionnements en provenance de k UFA/FC(QD, calculé comme la somme des produits, pour les k UFA/FC, des TT de l'association de l'usine avec chacune des UFA et des Fractions des QRT de chaque UFA/FC destinées à l'usine), ii) le Quota de Débités Résiduel (QDR) calculé sur la base du volume de grumes de BUBINGA présentes dans le parc à grumes de l'usine, en considérant le RMusine et, iii) le Quota de Débités Total de l'usine (QDT, calculé comme la somme des deux quotas ci-dessus.

Le Quota de Débités National (QDN), pour une année suivante, calculé comme la somme des QDT des usines autorisées à transformer (et commercialiser des débités de BUBINGA). Il est aussi, parallèlement, calculé un Potentiel de Débités National, pour une année donnée (PDTN) calculé comme la somme de QDN et du potentiel de débités total qui serait obtenu si tous les PRRT (potentiel de récolte résiduel total) dans chacune de toutes les UFA/FC (prises en compte comme fournisseurs des usines autorisées à transformer des grumes de BUBINGA) étaient transformés dans les usines clientes.

Le présent Modèle de Gestion de BUBINGA . Modèle dont l'un des mérites serait de proposer un certain niveau de traçabilité dans la chaîne de valeur des pieds de BUBINGA, dans la mesure où :

- L'attribution d'une autorisation de récolte de pieds de BUBINGA à une société forestière (lors de l'émission du CAE) est conditionnée par l'identification du titre forestier détenue par cette société dans la liste des fournisseurs en grumes de BUBINGA d'une usine demanderesse d'un quota de débités (pour une année considérée).
- Le quota de débités à accorder à une usine est calculé sur la base des quotas de récolte attribués à ses UFA/FC/etc. partenaires. Les volumes de débités à retrouver sur les marchés sont ainsi garantis de provenir de titres valides, le modèle mettant en œuvre un embryon de « certification d'origine » (des grumes ayant servir à produire les débités).

Le module informatique (Base de Données) associé au présent modèle met en œuvre un nouveau protocole de gestion de BUBINGA dans les forêts de production de son aire de distribution. Les principales caractéristiques de ce nouveau protocole sont :

- Le tarif de cubage est UFA-spécifique, et il est actualisé chaque année en vue d'améliorer progressivement la fiabilité de la prévision de récolte de BUBINGA dans chaque UFA ;
- Parmi les UFA contenues dans l'aire de distribution de BUBINGA, seules celles identifiées comme partenaires de transformateurs sont autorisées à récolter des pieds BUBINGA. Le présent protocole propose de se baser sur une enquête auprès des transformateurs sollicitant des quotas de débiter de BUBINGA pour identifier les UFA partenaires (et autres titres légaux), unités forestières dans lesquelles la récolte de pieds de BUBINGA sera autorisée.
- Le taux de transformation des pieds de BUBINGA (qui permet la prévision du volume de débités qui serait obtenu à partir d'une estimation de récolte de BUBINGA) est spécifique à un couple Usine-UFA (ou FC) ;
- Le quota de débités à accorder à un transformateur est lié à un quota de récolte de BUBINGA (sous la forme quota de récolte total, QRT) dans chacune des titres forestiers légaux à partir desquels le transformateur s'approvisionne en grumes de BUBINGA ;

- Le nouveau concept de « Quota de Récolte » de BUBINGA dans une UFA permet de distinguer la possibilité de BUBINGA sur pied dans une AAC d'une UFA (ou FC) du volume qui sera autorisé à être récolté, sur la base d'un set de considérations autant scientifiques, techniques que commerciales (historique et prévisions de volumes commerciaux à destinations des transformateurs partenaires). Ainsi, sur la base des considérations ci-dessus, il pourrait arriver que dans une UFA (ou FC) donnée, la récolte de BUBINGA soit interdite dans une AAC donnée (Quota de Récolte = 0) ;

Le protocole de gestion de BUBINGA élabore un benchmark national de valorisation de de BUBINGA , benchmark introduisant un ensemble de « critères de performance » en matière de valorisation de BUBINGA , autant à l'échelle de la forêt qu'à l'échelle de l'industrie de première transformation de BUBINGA . Sur la base d'un tel benchmark, il devient possible de réaliser un benchmarking pour chaque UFA (ou FC) et chaque usine de transformation, en vue d'évaluer sa performance (historique) dans la valorisation de cette essence en tant qu'essence inscrite aux annexes II de la CITES (soumise de ce fait à un quota, et donc exigeant de chacun des intervenants dans sa chaîne de valeur d'en maximiser la valeur). Une telle évaluation de la performance individuelle des acteurs dans les deux principaux maillons pris en compte dans la chaîne de valeur de BUBINGA (exploitation forestière et première transformation) devrait permettre d'introduire éventuellement des sanctions à l'encontre des acteurs présentant une performance historique médiocre (relativement au benchmark national) ;

- Le protocole de gestion de BUBINGA met de ce fait en œuvre une chaîne de traçabilité (et de légalité) des débités de BUBINGA dans la mesure où il permet de « connecter » chacun des transformateurs sollicitant un quota de débités à des titres forestiers légaux qui l'approvisionnent en grumes de BUBINGA.
- Dans le protocole, le quota de débités national n'est plus calculé comme un plafond, mais comme une prévision du volume de débités qui pourrait effectivement approvisionner les divers marchés, en tant que somme des quotas de débités des usines ayant effectivement sollicité ces quotas. De même, parallèlement, le présent protocole permet de déterminer un quota de

récolte de BUBINGA dans l'ensemble des forêts de production de son aire de distribution, en tant que somme des quotas de récolte attribués aux UFA (et autres titres légaux, y compris ventes de coupe) identifiées comme partenaires par les transformateurs.

Sur la base du protocole, il sera de ce fait publié chaque nouvelle année, au niveau national :

- Le Potentiel Total de Récolte Bubinga dans l'ensemble des titres forestiers approvisionnant les usines ayant sollicité des quotas de débités (en tant que somme des potentiels sur pieds d'arbres de Bubinga a d'un diamètre supérieur au DME, dans les nouvelles AAC des UFA et Forêts Communales, et dans les VC et autres titres légaux), telle que révélée par les inventaires d'exploitation dans les dits titres légaux. Il sera aussi publié une possibilité totale « résiduelle », calculée comme le volume sur pied résiduel non autorisé à la récolte suite à la fixation des quotas dans les précédentes AAC encore ouvertes à l'exploitation (pour les ventes de coupe, il s'agira du volume sur pied résiduel) ;
- Pour chacun des titres forestiers pris en compte dans l'approvisionnement des usines sollicitant des quotas de débités, le Potentiel de Récolte de BUBINGA dans la nouvelle AAC, telle qu'obtenu à la suite d'un inventaire d'exploitation (en appliquant un tarif de cubage « local », éventuellement actualisé). Il sera aussi publié un Potentiel de Récolte Résiduel dans la précédente AAC encore ouverte à l'exploitation, calculée comme le volume sur pied résiduel non autorisé à la récolte suite à la fixation du quota dans ladite AAC (pour les ventes de coupe, il s'agira du volume sur pied résiduel) ;
- Le quota de récolte de BUBINGA dans chacune des nouvelles AAC des titres légaux pris en compte dans l'approvisionnement des usines ayant sollicité des quotas de débités. Il sera aussi publié un quota de récolte résiduel, dans la précédente AAC, calculé comme la différence entre le volume effectivement récolté dans la précédente AAC, et le quota de récolte total accordé pour la nouvelle année 8ainsi que les taux de consommation de chacun des arbres sur pieds disponibles dans la nouvelle et la précédente AAC. Ainsi donc, en

plus de fixer un Quota de Récolte de pieds de BUBINGA dans l'UFA (en fait dans les nouvelle et précédente AAC), il sera précisé :

- Le taux de récolte de pieds de BUBINGA (et donc le volume à récolter) dans la nouvelle AAC ;
- Le taux de consommation du quota résiduel de Bubinga (et donc le volume à récolter) dans la précédente AAC ;
- Et éventuellement, le taux de consommation du Potentiel résiduel de Bubinga (et donc le volume à récolter) dans la précédente AAC

- Le quota national de récolte de BUBINGA dans l'ensemble des titres légaux situés dans son aire de distribution. Il sera aussi publié un Potentiel national de récolte résiduel tel que déterminé ci-dessus ;
- Le quota de débités accordé à chaque usine l'ayant sollicité, quota de débités représentant la prévision de volume de débités prévisionnel obtenu à partir des approvisionnements futurs de l'usine en grumes de Bubinga par ses UFA (et autres titres légaux) partenaires. Il sera associé à ce quota de débités un quota de débités« résiduel » représentant le volume de débités prévisionnel qui serait obtenu à partir du volume résiduel (des années précédentes) de grumes de BUBINGA dans la parc à grumes de l'usine (en tant que différence entre les volumes « entrée usine » des précédentes années et les volumes effectivement transformés des mêmes années). En principe, le quota de débités à accorder à une usine pour la nouvelle année devrait être calculé comme la somme du quota et du quota résiduel (du fait que les grumes de Bubinga impliquées dans le calcul du quota résiduel sont déjà présentes dans le parc à grumes de l'usine) ;
- Le quota national de débités, pour l'ensemble des usines ayant sollicité des quotas de débités, et le quota national résiduel de débités. Le quota national de débités est calculé comme la somme de ces deux types de quotas ;
- Le potentiel national de débités de BUBINGA, en tant que prévision de production de débités dans une situation où la totalité du potentiel national de récolte de BUBINGA dans les titres forestiers légaux (identifiés par les transformateurs comme partenaires en vue de leurs approvisionnements en

grumes de BUBINGA) est transformé, Potentiel National de Débités calculé en utilisant les Taux de Transformation des « couples » usine-UFA (ou FC).

A la fin de chaque année, et pour le compte de l'année suivante, l'Autorité Scientifique CITES-Flore émet un ACNP dont les principales articulations sont:

- Synthèse des connaissances scientifiques (éventuellement actualisées par les résultats de nouveaux processus scientifiques) dans les forêts de production de son aire de distribution;
- Synthèse des activités de récolte, de transformation, et de commerce de BUBINGA au cours de l'année écoulée, et tendances historiques (à partir d'une année de référence);
- Évaluation critique du système de gestion de BUBINGA en vigueur dans les forêts de production de son aire de distribution;
- Détermination des divers quotas pour les divers intervenants dans la (courte) chaîne de valorisation des pieds de BUBINGA , autorisés à mener des activités de valorisation (quotas de récolte par titre forestier et au niveau national, quotas de débités au niveau des différentes usines et au niveau national), et détermination des potentiels résiduels (dans les AAC ouvertes à l'exploitation), en vue de mettre en lumière la rigueur dans la gestion des stocks de BUBINGA exploitables dans les titres en activité, et donc démontrer la qualité de la détermination des quotas (qui sont des fractions des « plafonds »/potentiels disponibles.

Chaque début d'une nouvelle année, il est organisé un Atelier National de Concertation sur le BUBINGA qui s'articule autour de:

- Présentation de l'ACNP/Assamela à l'ensemble de la « communauté » forestière;
- Concertations tripartites (AS/CITES-Flore, OG/CITES-Flore, Opérateurs Privés des secteurs forêt et transformation) autour:
    - Usines autorisées à exporter des débités de BUBINGA et titres forestiers dans lesquels la récolte de pieds d'Assamela est autorisée;
    - des quotas déterminés par l'AS/CITES-Flore;

Le modèle ci-dessus est mis en œuvre dans une base de données (BD), BD qui est destinée à être utilisée en appui au Comité Scientifique de l'AS/CITES-Flore, Conseil Scientifique qui prend des décisions sur des variables clés du modèle. La BD n'est donc pas, au stade actuel de son développement, un Système-Expert de Gestion de l'Assamela.

IV-2 MÉTHODOLOGIE DE CALCUL DES QUOTAS

Modèle actuellement en vigueur

Dans le cadre d'une étude réalisée en 2009, et portant sur la détermination du taux de transformation de l'Assamela, le protocole ci-dessous a été élaboré en vue de la détermination d'un Quota National de Débités d'Assamela:

DÉTERMINATION D'UN POTENTIEL NATIONAL DE RÉCOLTE DE PIEDS D'ASSAMELA:

Il est calculé comme la somme des projections « moyennes » de récolte de pieds d'Assamela (dans les titres forestiers en activité dans les forêts de production de l'aire de distribution de l'Assamela), projections obtenues des résultats des inventaires d'aménagement dans les dits titres (avec les tarifs de cubage des différentes phases des inventaires nationaux, au choix).

CALCUL DU TAUX DE TRANSFORMATION:

Il est calculé comme un taux de transformation national, historique (prenant en compte l'évolution de la performance, au fil des années, du « système » de valorisation des pieds de Bubinga). Les formules de régressions par la méthode des moindres carrés sont élaborées avec comme variable dépendante la série historique de valeurs des volumes effectivement récoltés de pieds de Bubinga tels qu'inscrit dans les DF10 (ou leur Logarithmenépérien), et comme variable indépendante les valeurs de DHP^2 (ou Ln(DHP)), valeurs de DHP tels qu'elles sont inscrites sur les fiches de prospection de pré-abattage.

CALCUL DU QUOTA NATIONAL DE DÉBITÉS.

Sur la base d'un ensemble de titres forestiers en activités pris en compte, ce Quota est fixe au fil des ans, il ne peut changer que si, i) les résultats des inventaires d'aménagement sont révisés, ou ii) d'autres titres entrent en activité. Il était calculé selon plusieurs approches, principalement celle dite « empirique » ci-dessous:

Et la prévision du volume maximum de débités (Quota national de débités) est donnée par :

$$VM_{débités} = TT_{moy.nat.} \times \sum_i V_{attribué\,à\,venir,i}$$

Avec :

I. $VM_{débités}$: volume total de débités prévisionnel pour l'année à venir ;
II. $V_{attribué\,année\,à\,venir,i}$ le volume total d'assamela autorisé à la récolte pour l'année à venir dans l'UFA i approvisionnant une usine (y compris la récolte des pieds résiduels dans les AAC en cours, tels que révélés par les inventaires de recolement) ;

avec $TT_{moy.nat.}$, la valeur moyenne des taux de transformation des usines en activité transformant l'assamela, tel que :

$$TT_{moy.nat.} = \frac{\sum_{usines} TT_{usine}}{N_{usine}}$$

- Avec, pour une usine prise séparément, les formules ci-dessous:

En appelant $\frac{\overline{V_{récolté}}}{\overline{V_{estimé}}}$ le « rendement moyen de la récolte » ($\overline{RR}$), et sachant qu'en fait $\frac{\overline{V_{débités}}}{\overline{V_{réc.entrée\ usine}}} = \overline{RM}$ (rendement matière global), on a que :

$$TT = \overline{RR} \times \overline{RM}$$

$$\overline{V_{débité}} = \frac{\sum_{i=1}^{i=n} V_{débité,i}}{\sum_{i=1}^{i=n} KK_i}$$

$$\overline{V_{réc.entrée\ usine}} = \frac{\sum_{i=1}^{i=n} V_{réc.entrée\ usine,i}}{\sum_{i=1}^{i=n} KK_i}$$

$$\overline{V_{récolté}} = \frac{\sum_{j=1\,à\,m} \sum_{i=1}^{i=n} V_{récolté,ij}}{\sum_{j=1\,à\,m} \sum_{i=1}^{i=n} K_{ij}}$$

$$\overline{V_{estimé}} = \frac{\sum_{j=1\,à\,m} \sum_{i=1}^{i=n} V_{estimé,ij}}{\sum_{j=1\,à\,m} \sum_{i=1}^{i=n} K'_{ij}}$$

ATTRIBUTION D'UN QUOTA DE DÉBITÉS AUX USINES:

Sur la base d'un Quota National de Débités en vigueur (sur une période donnée), chaque usine transformant le Bubinga introduit une demande auprès de l'Organe de Gestion CITES-Flore (Direction des Forêts, MINFOF) en vue de solliciter un « Quota » de débités donné (en tant qu'une fraction du quota national de débités). L'Organe de Gestion attribuait ainsi des quotas individuels », en fonction des demandes, apparemment de manière indépendante des prévisions de Récolte de pieds de Bubinga et d'approvisionnement en grumes des usines demanderesses par leurs « forêts» partenaires. La seule condition semblant être que la somme des quotas de débités ainsi attribués au cours d'une même année ne dépasse pas le Quota National de Débités « fixé » (quota national de Débités inscrit dans l'ACNP émis par l'Autorité Scientifique CITES-Flore)

Nouveau modèle développé

Principe de détermination des quotas de débités

Le quota de débités résulte d'une décision des instances compétentes, en particulier de l'Autorité Scientifique CITES-Flore, à travers un processus d'analyse prenant en compte un ensemble de paramètres techniques et scientifiques de la gestion forestière et de la transformation industrielle, sur une base historique.

Le quota de débités, à accorder à une usine, est de ce fait une fonction des Taux de Transformation associés aux UFA approvisionnant l'usine en grumes de BUBINGA et de quotas de récolte (de volume de Bubinga) autorisés dans les UFA approvisionnant l'usine. Le quota de débités est une grandeur calculée pour l'exercice/année « à venir », et exploite les données historiques d'activités de l'usine en matière de transformation de de BUBINGA ainsi que les données historiques de chacune des UFA en matière de valorisation des pieds de BUBINGA .

Le quota de débités (QD) pour une usine est ainsi donné par les relations :

- *QDusine = f (QDusine-UFA1, ..., QDusine-UFAk)*
- *QDusine = f (g(TTusine-UFA1, Quota RécolteUFA1), ..., g(TTusine-UFAk, Quota RécolteUFAk))*

Dans le calcul du quota de débités pour une usine donnée, il est pris en compte les situations où :

- *Une usine est alimentée en grumes de BUBINGA par plusieurs UFA, et ;*
- *Une UFA alimente plusieurs usines, et donc une situation dans laquelle des UFA sont indépendantes des usines et auraient de ce fait une stratégie commerciale autonome.*

Le **quota de débités d'une usine est ainsi conditionné par les quotas de récolte de BUBINGA accordés aux UFA partenaires de l'usine**.

Le quota national de débités de Bubinga (à retrouver sur le marché « global », marché qui englobe les marchés local et international) est la somme des quotas de débités accordés aux usines ayant formulé une demande officielle d'attribution de quota de débités. Un tel quota pourrait varier d'une année à l'autre, sans dépasser le quota national du pays tel qu'il serait déterminé sur la base de la possibilité forestière totale contenue dans les AAC des UFA de production de bois d'œuvre (y compris forêts communales et Ventes de Coupe) dans l'aire de distribution de BUBINGA . Il est de ce fait proposé de considérer que, chaque année, il soit publié :

- ✓ Le quota national de débités « accordé » aux usines autorisées à la transformation de BUBINGA (en tant que somme des quotas de débités accordés aux usines demanderesse) ;
- ✓ Le quota national de débités « potentiel », en tant que « plafond national » de débités de BUBINGA que l'industrie locale de transformation des bois pourrait mettre sur les marchés.

Méthodologie de détermination du potentiel de récolte (de BUBINGA sur pied), et variables prises en compte

Le potentiel de récolte dans une nouvelle AAC (Assiette Annuelle de Coupe) est basé sur les résultats des inventaires d'exploitation dans la nouvelle AAC, et, en prenant en compte tous les pieds de BUBINGA de DHP supérieur au DME et proposés par le concessionnaire à la récolte (et validés par les services compétents du Ministère en charge des Forêts), est calculé avec comme tarif de cubage le Tarif de Cubage actualisé. Le potentiel de récolte est déterminé par le Comité Scientifique de l'Autorité Scientifique CITES-Flore sur la base d'une analyse approfondie de :

- Considérations pertinentes du plan d'aménagement (PA) ;
- Structure diamétrique des stocks de pieds de BUBINGA dans l'AAC ;

Sur la base des considérations ci-dessus, le Comité Scientifique amende les résultats des inventaires d'exploitation (en termes de nombre de pieds dans les diverses classes de diamètre à autoriser à la récolte).

Une situation pourrait se présenter dans laquelle, sur la base d'arguments scientifiques solides, la récolte de BUBINGA dans une AAC donnée d'une UFA pourrait être interdite, et donc aucun quota de récolte de BUBINGA attribué pour cette UFA (dans la nouvelle AAC) au cours d'une année. Une telle mesure serait justifiée pour garantir la durabilité de l'exploitation de BUBINGA, non pas seulement à l'échelle d'une UFA, mais aussi à l'échelle de chaque AAC d'une UFA.

Méthodologie de détermination du quota de récolte et variables prises en compte

Le quota de récolte de BUBINGA, dans chacun des titres légaux de son aire de répartition (UFA, Forêt Communale), est proposé par l'Autorité Scientifique CITES-Flore sur la base d'une analyse approfondie des statistiques d'historique de valorisation du potentiel de récolte dans les AAC précédentes (ratios (nombre de pieds récoltés)/(nombre de pieds potentiel) ou (volume récolté)/(potentiel de récolte)). Une telle analyse permet d'attribuer un taux de récolte à chaque UFA. Le taux de récolte de BUBINGA est une grandeur réévaluée sur une base annuelle sur la base des performances commerciales du concessionnaire (performance en valorisation du potentiel de récolte en vue de l'approvisionnement des usines partenaires).

Le quota de récolte de BUBINGA dans une UFA est de ce fait une fraction du potentiel de récolte dans la nouvelle AAC ; il est exprimé uniquement en termes de volume dde BUBINGA à récolter.

Une UFA ne se verra attribuer un quota de récolte de BUBINGA (et donc autorisée à récolter de BUBINGA dans une nouvelle AAC), que si elle a été identifié/signalée comme partenaire d'au moins une des usines sollicitant des quotas de débités de BUBINGA. Il est de ce fait admis que la sollicitation d'un quota de débités par des usines est le « Déclencheur » des activités de récolte de BUBINGA dans les UFA identifiées comme partenaires des usines commercialisant des débités de BUBINGA. L'Autorité Scientifique, sur la base des ses analyses, est compétente pour établir chaque année, la liste des UFA autorisées à récolter de BUBINGA (et leurs quotas de récolte correspondants). Si au cours d'une année (à venir), une usine projetterait de s'approvisionner auprès d'une vente de coupe (VC) ou de tout autre titre légal de faible durée de validité, ce titre (VC, ARB, etc.) devrait être signalé par l'usine en tant qu'AAC d'une UFA « générique » (UFA n'ayant aucun historique d'exploitation) ; dans une telle situation, il sera considéré que le quota de récolte est égal au potentiel de récolte.

En ce qui concerne le BUBINGA en tant qu'essence inscrite aux annexes II de la CITES, il est de ce fait prescrit que ce soit le quota de récolte (et non le potentiel de récolte) qui soit le volume de BUBINGA à inscrire dans le CAE (Certificat Annuel d'Exploitation), et que ce quota de récolte soit déterminé par l'Autorité Scientifique CITES-Flore.

c) Méthodologie de détermination des quotas de débités

Base conceptuelle

Dans la méthodologie de détermination des quotas de débités ci-dessous, il est pris en compte un ensemble de ratios de performance (rendement-matière), autant dans le volet forestier » que dans le volet « industriel ». Ces divers ratios de performance serviront à définir un benchmark national des divers paramètres d'optimisation de la valeur de BUBINGA en tant que ressource critique (du fait de son inscription aux annexes II de la CITES) dont la valorisation en débités d'une « unité de volume sur pied » devrait être maximisée.

Ce benchmark national, en tant que référentiel de performance au niveau national (définie soit comme la moyenne nationale des performances des acteurs, soit comme la médiane, soit comme la meilleure performance d'un acteur national), sera utilisé pour un benchmarking de chacun des intervenants dans la chaîne de valeur de BUBINGA (essentiellement le concessionnaire forestier et l'industriel), en vue de procéder chaque année à une évaluation de la « filière » BUBINGA . Une telle évaluation pourra résulter en des propositions de suspension des activités dans la chaîne de valeur de BUBINGA des acteurs démontrant des performances considérées « médiocres ».

Approche empirique

Sur la base d'une analyse statistique de divers historiques (à partir d'une année de référence), il est déterminé un ensemble de ratios des performances de l'usine en matière de valorisation des approvisionnements en grumes de BUBINGA (rendement-matière de façonnage parc à grumes, rendement-matière de transformation des billons de BUBINGA , rendement matière global de transformation/valorisation des grumes d'e BUBINGA) et des ratios de performance du Concessionnaire forestier en matière de valorisation des pieds de BUBINGA au niveau de chaque UFA partenaire de l'usine (rendement-matière de façonnage des billes en vue de leur transport, rendement matière de récolte des pieds de BUBINGA). Le produit de cette série de rendements matière (prenant en compte les performances historiques), constitue, pour chaque UFA associée à l'usine partenaire, ce qui est considéré comme le « Taux de Transformation » des pieds de BUBINGA de l'UFA.

Le quota de débités à accorder à une association d'une usine avec une de ses UFA partenaires est égal au produit du taux de transformation associé à l'UFA par le quota de récolte de BUBINGA dans l'UFA.

Pour une usine alimentée par plusieurs UFA, le quota de débités de l'usine est calculé comme la somme des quotas de débités individuels de chaque association de l'usine avec chacune de ses UFA partenaires (en prenant en compte la fraction éventuelle du quota de récolte d'une UFA que le concessionnaire destine à l'usine).

Approche analytique

Sur une base historique, à partir de toutes les données individuelles de récolte des pieds de BUBINGA dans les AAC exploitées dans une UFA donnée (à partir d'une année de référence), il est établi une équation de régression linéaire (par la méthode des moindres Bcarrés) reliant, pour chaque pied de BUBINGA récolté, le volume réel récolté de chaque pied de BUBINGA (variable dépendante) au volume (préalablement) estimé (volume estimé déterminé, pour chaque pied de BUBINGA, avec le tarif de cubage éventuellement actualisé en vigueur au cours de l'année de récolte dudit pied). Cette équation de régression est destinée à traduire le quota de récolte dans la nouvelle AAC d'une UFA (en tant de volume estimé sur pied) en volume effectivement récolté dans la dite UFA. Le rendement-matière de façonnage des grumes au parc forêt (en vue de leur transport) et les ratios de performance de l'usine en matière de valorisation en débités de ses approvisionnements en grumes de BUBINGA sont utilisés pour le calcul du quota de débités que l'usine obtiendrait de la transformation du quota de récolte attribuée à une UFA donnée.

Pour une usine alimentée par plusieurs UFA, le quota de débités de l'usine est calculé comme la somme des quotas de débités individuels de chaque association de l'usine avec chacune de ses UFA partenaires (en prenant en compte la fraction éventuelle du quota de récolte d'une UFA que le concessionnaire destine à l'usine).

Calcul du potentiel de récolte

L'approche algorithmique consiste à :

- Décider du nombre de pieds de BUBINGA autorisés à la récolte, par classe de diamètre ;
- Déterminer le volume prévisionnel de récolte de BUBINGA en appliquant à la valeur médiane de chaque classe de diamètre le tarif de cubage actualisé.

On a de ce fait la formule :

$$PR_{ufa} = \sum_{Classes\ Diam > DME} NPP_{ClDiam} \times TC_{act}(DHP_{médian})$$

Avec NPP_{ClDiam} le nombre de pieds d'Assamela prospectés/retenus dans chaque classe de diamètre au-dessus du DME.

Le même tarif de cubage est de ce fait utilisé pour toutes les classes de diamètres prises en compte dans l'inventaire d'aménagement (la classe la plus basse étant la classe 90-100 cm).

Calcul du quota de récolte, pour l'année 2016 prise comme « année de référence »

Sur la base des ratios historiques de récolte de BUBINGA dans les précédentes assiettes annuelles de coupe (sous la forme (volumes effectivement récoltés au cours de l'année)/ (Potentiel de récolte déterminé pour l'année)), il est déterminé un «Taux historique de Consommation des Potentiels de récolte» attribués (TCPufa). Sur la base de :

- La valeur de TCP_{ufa} obtenue ;
- Des projections commerciales d'approvisionnement des usines partenaires en grumes de BUBINGA ;

Le Comité scientifique de l'Autorité Scientifique CITES-Flore définit un «taux de récolte » pour chaque UFA (Ωufa) à appliquer au potentiel de récolte dans la prochaine assiette de coupe. Le quota de récolte (QRufa) à attribuer au Concessionnaire pour le compte de la prochaine AAC est de ce fait calculé comme :

$$QR_{UFA} = \Omega_{UFA} \times PR_{UFA}$$

Il est à considérer que, une AAC étant ouverte à l'exploitation pendant deux exercices/années, il est déterminé un quota résiduel dans la précédente assiette de coupe (calculé comme la différence entre le Quota de Récolte attribué pour cette AAX et le Volume effectivement récolté dans cette AAC). Ainsi, pour chaque année, il est publié :

- Le Quota de Récolte (QR) dans la prochaine année de coupe ;
- Le Quota de Récolte Résiduel (QRR) dans la précédente assiette de coupe encore ouverte à l'exploitation (calculé comme QR – (Volume effectivement récolté dans l'AAC)) ;
- Le Potentiel de Récolte Résiduel (PRR) dans la précédente AAC encore ouverte à l'exploitation

- Le quota total de récolte (QRT) de BUBINGA attribué au concessionnaire dans l'UFA (pour les 02 AAC ouvertes à l'exploitation).

Le quota total de récolte de BUBINGA dans une UFA donnée, à attribuer au Concessionnaire, ne serait pas automatiquement calculé comme la somme des quantités ci-dessus. Sur la base d'un ensemble de critères, le Comité Scientifique pourrait décider du quota total à accorder et des modalités y relatives (révision du quota de récolte dans la nouvelle AAC et/ou révision du quota de récolte résiduel, compte tenu des « arguments » du concessionnaire, et/ou autorisation de récolte d'une fraction du Potentiel de Récolte résiduel). QRT est de ce fait déterminé selon la formule :

$$QRT_{UFA} = \beta_1 QR_{UFA} + \beta_{0,Q} QRR_{UFA} + \beta_{0,P} PRR_{UFA}$$

Avec :

- β_1 : coefficient de consommation du Quota de Récolte dans la nouvelle AAC (de ce fait $\beta_1 QR_{UFA}$ est le quota de récolte en définitive attribué dans la nouvelle AAC)
- $\beta_{0,Q}$: coefficient de consommation du quota résiduel de récolte dans la précédente AAC encore ouverte dans l'exploitation ;
- $\beta_{0,P}$: Coefficient de consommation du potentiel résiduel de récolte dans la précédente AAC encore ouverte dans l'exploitation

Les coefficients ci-dessus sont fixés par le Comité Scientifique de l'Autorité Scientifique (CITES-Flore), sur la base d'une « négociation » avec les Concessionnaires (des UFA). Ainsi, on pourrait considérer que, dans la détermination de QRTUFA, on applique le protocole suivant, compte tenu d'un Volume de récolte de pieds de BUBINGA cible (basé sur les projections commerciales du concessionnaire en termes d'approvisionnement de son (ses) usine (s) partenaires) :

- Considérer dans un premier temps la quantité QR (quota de récolte dans la nouvelle AAC), et fixer de ce fait le coefficient β_1 ;
- Si la totalité de QR (avec donc $\beta_1=1$) ne permet pas d'atteindre le Volume-cible, considérer, dans un deuxième temps, la quantité QRR (quota de récolte résiduel dans la précédente AAC), et fixer de ce fait la valeur $\beta_{0,Q}$;
- Si malgré la totalité de QR et de QRR (avec donc $\beta_{0,Q}=1$), le volume-cible n'est pas atteint, considérer finalement la quantité PRR (potentiel de récolte résiduel dans la précédente AAC), et fixer de ce fait la valeur de $\beta_{0,P}$ de telle manière que QRT_{UFA} soit égal au volume-cible ;

Il est aussi à considérer la détermination d'un Potentiel de Récolte Résiduel Total (PRR), dans l'UFA, prenant en compte les potentiels résiduels (sur pieds) dans la nouvelle AAC et dans la précédente AAC (encore ouverte à l'exploitation). Nous avons ainsi :

Pour le potentiel de récolte résiduel dans la nouvelle AAC (PRRufa,1) :

$$PRR_{ufa,1} = PR_{UFA,1} - \beta_1 QR_{UFA}$$

Pour le potentiel de récolte résiduel dans la précédente AAC (PRRufa,0), il est égal à la différence du potentiel de récolte obtenu pour la précédente assiette de coupe (Potentiel de Récolte dans l'AAC – Quota de Récolte attribué dans l'AAC) auquel au soustrait la fraction dudit potentiel de récolte prise en compte dans la détermination du Quota de Récolte Total (QRT) pour la prochaine année :

$$PRR_{ufa,01} = PRR_{UFA,0} - \beta_{0,P} PRR_{UFA,0} = (1 - \beta_{0,P}) PRR_{UFA,0}$$

Pour le potentiel résiduel de récolte total (PRRT), au cours de la prochaine année, il est la somme des deux potentiels ci-dessus :

$$PRRT_{UFA} = PRR_{ufa,1} + PRR_{ufa,0}$$

Il est à considérer que le ratio de récolte du potentiel est une grandeur qui sert uniquement de base de calcul pour le degré de consommation du potentiel, la grandeur la plus «objective» devant être le volume effectivement récolté (et commercialisé), dans la mesure où ce volume rend compte de l'importance du réseau commercial du concessionnaire. Du fait que le quota de récolte total (QRT) privilégie le quota de récolte dans la nouvelle AAC (et donc que β_1 est le premier coefficient à fixer), le ratio de récolte joue un rôle central dans la détermination du taux de récolte dans la nouvelle AAC (Ω_{UFA}).

f) Calcul du quota de récolte, pour les années subséquentes

Pour les années subséquentes, la méthodologie d'actualisation/ajustement du « Quota de Récolte » et de ses variables associées est articulée autour de la méthodologie ci-dessous

Tableau 1: Paramètres d'ajustement du « Quota de Récolte » pour une année donnée

Année	α	β_0	β_1	QRR_{-1}	PRR_{-1}	QR_{base}	$QRT_{attribué}$
0 (de référence)							
1							
2							
. .							
n							

Avec :

- QRR_{-1} : valeur du quota résiduel de récolte dans l'assiette précédente, utilisée dans le calcul de $QRT_{attribué}$;
- PRR_{-1} : valeur du potentiel résiduel de récolte dans l'assiette précédente, utilisée dans le calcul de $QRT_{attribué}$;
- QR_{base} : Quota de Récolte de base, dans la nouvelle AAC (année 0), calculée comme $QR_{base} = \Omega_{(historique,\ années\ antérieures)} \times PR_0$;
- Nous sommes actuellement dans l'année **1**, et nous disposons des valeurs numériques de toutes les variables apparaissant dans le tableau ci-dessus.

Tableau 2: Calcul du Quota de Récolte Total attribué (QRTattribué), pour chaque nouvelle année.

Année	PR	PRT	QR_{base}	$QRT_{attribué}$	VR	$CP_{année}$ (os)	$CP_{hist.}$ ($\Omega_{hist.}$)
0							
1							
.							
.							
n							

Avec :

- **PR** : Potentiel de Récolte dans nouvelle AAC, tel que déterminé en appliquant le « Tarif de Cubage Actualisé » aux résultats de l'inventaire d'exploitation dans la nouvelle AAC ;

- **PRT** : Potentiel de Récolte Total, en tant que Potentiel de Récolte prenant en compte l'éventuelle autorisation d'exploitation accordée dans la précédente AAC. PRT est donné par la formule :
- ***$PRT_{année\ i} = PR_{année\ i}$ (nouvelle AAC) + $\beta_{0,\ année\ i}$ x $QRR_{année\ i-1}$ + $\beta_{1,\ année\ i}$ x $PRR_{année\ i-1}$***
- ***$QR_{base,i}$: Quota de Récolte « initial » pour l'année considérée = $\Omega_{hist.\ i-1}$ x PR_i*** (il prend donc uniquement en compte la nouvelle AAC), qui constitue le QUOTA DE RÉCOLTE ACTUALISÉ pour toute année subsöquente à l'année de référence.
- **$QRT_{attribué,i}$** = Quota de Récolte Total attribué par la Commission Scientifique. Il est donné par la formule
- ***$QRT_{attribué,i} = \alpha_i$ x $QR_{base,i}$ + $\beta_{0,\ année\ i-1}$ x $QRR_{année\ i-1}$ + $\beta_{1,\ année\ i-1}$ x $PRR_{année\ i-1}$***
- **VR_i** : Volume récolté, enregistré à la fin de l'année ;
- ***$\omega_{i-1} = (VR_{i-1})/(QRT_{attribué,i-1})$*** coefficient de performance des activités de récolte au courant de l'année précédente, et est relatif uniquement à la performance sur une année.
- ***$\Omega_{hist,i-1} = \omega_{i-1}$ x ((Somme pour les années 0 à i-1($QRT_{attribué,k}$))/(Somme pour les années 0 à i-1(PRT_k)))***

Cette nouvelle formule, qui s'appliquera pour chaque nouvelle année dans le calcul de $QR_{base,i}$ selon la forme ci-dessus, prend en compte une performance annuelle (année précédente) et une performance historique « globalisée » à partir d'une année de référence 0 (de début d'application du concept de Quota de Récolte).

On a ainsi, pour l'année 2017 (ici l'année 1, l'année 2016 étant l'année 0) :

- PR_1 connu (résultats d'inventaires)
- PRT sera calculé à la suite de la session de la Commission Scientifique (fixation des valeurs des paramètres β_0 et β_1)
- QR_{base}, connu, car ω_0 (= VR_0/QRT_0) connu, et $\Omega_{hist,0}$ (=ω_0 x ($QRT_{attribué,0}/PRT_0$)) connu
- QRT_1 sera calculé à la suite de la session de la Commission Scientifique (fixation des valeurs des paramètres α_1, $\beta_{0,1}$ et $\beta_{1,1}$)

Sur la base de cette actualisation du calcul du « Quota de Récolte » dans une UFA donnée, le calcul du « Potentiel Résiduel de Récolte Total » dans une UFA subit aussi un ajustement selon la méthodologie ci-dessous.

- ***$PRRT_{UFA} = PRR_{UFA,1} + PRR_{UFA,01} + QRR_{UFA,01}$***

Avec :

- *$PRR_{UFA,1} = (1 - \beta_1\ \Omega_0)\ PR_{UFA,1}$*
- *$PRR_{UFA,01} = (1 - \beta_{0,F})\ PRR_{UFA,0}$*

N.B. *: $PRR_{UFA,0}$ est calculé de la même manière que $PRR_{UFA,1}$, avec comme coefficients β_1 et Ω_0 ceux utilisés l'année précédente (et donc β_0 et Ω_{-1})*

- $QRR_{UFA,01} = (1 - \beta_{0,Q})\ QRR_{UFA,0}$

Nous désignons par :

- **$PRRT_{UFA}$** : le ***« Potentiel Résiduel de Récolte Total »*** dans l'UFA, pour **l'année à venir**, après application des coefficients d'ajustements en vue de la détermination du « Quota de Récolte Total » (QRT_{UFA})à attribuer dans l'UFA (prenant en compte une situation d'ouverture de 02 assiettes de coupe à l'exploitation, l'une des 02 AAC ayant été exploitée au cours de l'année encours/précédente)
- **$PR_{UFA,1}$** : le ***« Potentiel de Récolte »*** disponible dans **la nouvelle assiette de coupe** (celle ouverte pour la prochaine année), tel que révélé par l'application du Tarif de Cubage actualisé aux résultats d'inventaire d'exploitation ;
- **$PRR_{UFA,1}$** : le ***« Potentiel de Récolte Résiduel »*** dans la nouvelle assiette de coupe (celle ouverte pour la prochaine année), après décision du Comité Scientifique sur le coefficient d'ajustement à appliquer au « Quota de Récolte «de base » ;
- **$PRR_{UFA,01}$** : le ***« Potentiel de Récolte Résiduel »*** dans la **précédente assiette de coupe** (celle exploitée pendant l'année précédente ou l'année « en cours » ;
- **$PRR_{UFA,0}$** : le ***« Potentiel de Récolte Résiduel »*** dans **la précédente assiette de coupe**, après passage de l'exploitation, compte tenu du Quota de Récolte qui avait été pris en compte dans la précédente assiette de coupe pour le calcul du « Quota de Récolte Total » au cours de la précédente année (sur Décision du Comité Scientifique) ;
- **$QRR_{UFA,01}$** : le ***« Quota de Récolte Résiduel »*** dans **la précédente assiette de coupe** (celle exploitée pendant l'année précédente ou l'année « en cours ») ;
- **$QRR_{UFA,0}$** : le ***« Quota de Récolte Résiduel »*** dans la **précédente assiette de coupe**, après passage de l'exploitation, compte tenu du Quota de Récolte qui avait été pris en compte dans la précédente assiette de coupe (sur Décision du Comité Scientifique) ;
- **β_1** : Le ***« Coefficient d'ajustement du Quota de Récolte »*** dans la **nouvelle assiette de coupe**, tel que DÉCIDÉ par le Comité Scientifique, POUR LA PROCHAINE ANNÉE ;
- **$\beta_{0,P}$** : Le ***« Coefficient d'ajustement du Potentiel Résiduel de Récolte »*** dans **la précédente assiette de coupe**, tel que DÉCIDÉ par le Comité Scientifique, POUR LA PROCHAINE ANNÉE ;
- **$\beta_{0,Q}$** : ***Le « Coefficient d'ajustement du Quota Résiduel de Récolte »*** dans **la précédente assiette de coupe**, tel que DÉCIDÉ par le Comité Scientifique, POUR LA PROCHAINE ANNÉE ;
- **Ω_0** : le ***« Coefficient de Performance (historique) »*** de valorisation des Quotas de Récolte Totaux attribués au cours des années précédentes (à partir d'une année

de référence) combiné au taux d'utilisation des Potentiels de Récolte Totaux disponibles au cours des années précédentes.

Calcul du quota de débités

- **Quota local**
  - **Approche empirique**

Données utilisées

Les données utilisées pour le calcul du quota de débités, pour une usine donnée sont :

- Le Quota de récolte total attribué à chacune des UFA partenaires de l'usine ;
- Les rendements matière de valorisation des approvisionnements en grumes de BUBINGA , par l'usine (rendement-matière de façonnage dans les parcs à grumes et rendement-matière de transformation des billons, OU rendement-matière de valorisation des approvisionnements en grumes) ;
- Les rendements matière de valorisation de la production forestière de BUBINGA par chacune des UFA partenaires de l'usine (rendements de façonnage dans les parcs forêt, et rendement de récolte des pieds de BUBINGA) ;

Approche algorithmique

L'approche algorithmique consiste :

Pour l'usine :

À établir, sur une base historique, le rendement matière historique de transformation des approvisionnements en grumes de l'usine, sous la forme d'un rapport de la somme des volumes effectivement consommés par l'usine (et donc « entrés » dans la chaîne de transformation) au fil des années, sur la somme des volumes de débités effectivement obtenus au fil des années comme outputs de la transformation des billons de BUBINGA. Ceci constitue le « rendement-matière » historique ($\boldsymbol{RM}_{historique}$) de valorisation des approvisionnements en grumes d'assamela, les volumes consommés par l'usine constituant une proportion donnée (éventuellement 100%) des volumes entrés dans le site de l'usine (appelé aussi « Volume Entrée Usine/VEU ») ;

Prendre une année de référence ;

Compiler toutes les statistiques annuelles de transformation de BUBINGA dans l'usine considérée pour toutes les années antérieures, au cours desquelles elle a été approvisionnée par les k UFA, et construire le tableau ci-dessous :

Année	***Volume consommé***	***Volume de débités***	***RM***
Année de référence			
·			
·			
·			
Année N			
	TOTAL 1	TOTAL 2	

- Le rendement-matière historique $RM_{historique}$ **est donnée :**

$$RM_{historique} = \frac{TOTAL2}{TOTAL1}$$

Il est à noter que le rapport ci-dessus n'est pas égal au rendement matière moyen qui se calcule comme : $\overline{RM} = \frac{\sum_1^N RM_i}{N}$

Au cours des années subséquentes, il suffit d'ajouter la ligne correspondant à l'année considérée et recalculer TOTAL 1 et TOTAL 2, et ensuite la valeur actualisée de $RM_{historique}$

- Pour l'UFA, il est déterminé, sur une base historique, le rendement-matière de façonnage et le rendement-matière de récolte, selon l'approche algorithmique ci-dessous :

Pour le rendement-matière historique de façonnage (des billes en vue de leur transport), et sur la base des données historiques (à partir d'une année de référence) des volumes des billes récoltées (données de DF10) et des volumes correspondants des grumes transportées vers les usines (données correspondantes des lettres de voiture/LV), calculer le rendement-matière de façonnage ($RM_{façonnage}$) selon la formule :

$$RM_{façonnage} = \frac{\sum_{années} V_{transporté}}{\sum_{années} V_{récolté}}$$

Pour le rendement matière historique de récolte, et sur la base des données historique de prospection et de récolte dans les AAC déjà exploitées (à partir d'une année de référence), et compte tenu du tarif de cubage (éventuellement actualisé) en cours dans chacune des AAC au moment de la prospection, il est obtenu une série de données individuelles sur les volumes estimés des pieds de BUBINGA récolté (chaque série de données de volumes estimés de pieds de BUBINGA étant obtenu selon la formule :

$$RM_{récolte} = \frac{\sum_{années} V_{récolté}}{\sum_{années} V_{estimé}}$$

Calcul du taux de transformation

Sur la base des valeurs historiques ci-dessus de $RM_{historique}$, $RM_{récolte}$ et de $RM_{façonnage}$, le taux de transformation de l'association d'une usine avec une UFA ($TT_{transf,ufa}$) est calculé comme :

$$TT_{transf,ufa} = RM_{hist,usine} \times RM_{hist,récolte,ufa} \times RM_{hist,façon,ufa}$$

Le taux de transformation est de ce fait historique dans la mesure où il est « amendé » chaque nouvelle année avec la « performance » du couple usine-UFA. Il est à noter que les rendements matière associés à l'usine sont indépendants de ceux associés à l'UFA.

CALCUL DU QUOTA « LOCAL » DE DÉBITÉS (POUR UNE USINE ALIMENTÉE PAR K UFA)

Le quota local de débités d'une usine (QDusine) alimentée par k UFA, chacune des UFA dédiant une fraction ξusine de son quota total de récolte à l'usine considérée (selon des données fournies par les concessionnaires eux-mêmes, et sur la base de l'historique commerciale du concessionnaire en rapport avec sa production de Bubinga), est calculé selon la formule :

$$QD_{usine} = \sum_{UFA_1}^{UFA_k} \xi_{usine,i} \times TT_{transf,ufa} \times QRT_{ufa}$$

Il est pris en compte ci-dessus le quota de récolte total (combinaison du quota de récolte dans la prochaine AAC, du quota résiduel dans la précédente AAC, et éventuellement du potentiel résiduel dans la précédente AAC).

Il est à noter que le quota de débités est calculé sur une base annuelle, et est donc révisé sur la même base. Compte tenu de l'historique de l'approvisionnement de l'usine en grumes de BUBINGA (volume entrée usine) et de son historique de transformation (volume effectivement consommé par la scierie, et pris en compte dans le calcul du rendement-matière de valorisation de BUBINGA), il est publié chaque année :

- Le quota de débités accordé à l'usine, calculé sur la base de ses approvisionnements futurs en grumes de BUBINGA par ses UFA partenaires (sur la base d'un quota de récolte total attribué à chacune desdites UFA) ; Le quota de débités résiduel (QDRusine), calculé sur la base du volume résiduel de grumes dans le parc à grumes, non consommées par l'usine au cours des années précédentes (pour un maximum des deux dernières années), selon la formule :

$$QDR_{usine} = RM_{hist,usine} \sum_{année-1}^{année-2} (V_{entrée\ usine} - V_{transformé})$$

Approche analytique o
Données utilisées

Les données utilisées sont :

- ✓ Les séries de données historiques sur la récolte de pieds de BUBINGA dans les AAC successives (à partir d'une année de référence), qui permettront d'établir une formule analytique entre des quantités globales, en l'occurrence entre un quota de récolte et le volume total qui sera effectivement obtenu à la suite de la récolte de tout le quota. Comme ci-dessus, il est considéré que chaque série de données sur le volume estimé des pieds de BUBINGA effectivement récoltés au cours d'une année (dans une AAC correspondante) est obtenue grâce à l'application du tarif de cubage (éventuellement actualisé) utilisé lors de la réalisation de l'inventaire d'exploitation dans l'AAC considérée ;

- ✓ Le rendement-matière historique de valorisation des approvisionnements en grumes de BUBINGA, de l'usine considérée ;
- ✓ Le rendement matière historique de façonnage des billes dans le parc forêt de l'UFA (en vue de leur transport) ;

Approche algorithmique

Détermination de la fonction reliant le potentiel de récolte (volume total estimé sur pied) et la récolte effective (volume total récolté correspondant)

A partir des données historiques ci-dessus de récolte des pieds de BUBINGA dans une UFA donnée, déterminer la pente (Aufa) et l'ordonnée à l'origine (Bufa) de la droite de régression linéaire entre les données historiques des volumes obtenus des pieds individuels de BUBINGA récoltés caractérisés par leurs différents DHP (Vrécolté,DHP, variable dépendante) et les données historiques des volumes estimés des pieds individuels de BUBINGA récoltés caractérisés par les mêmes DHP (Vestimé, DHP, variable indépendante). Il s'est obtenu une formule de la forme :

$$V_{récolté,DHP} = B_{UFA} + A_{UFA}V_{estimé,DHP}$$

Cette formule est sur une base individuelle, pour chaque pied de BUBINGA pris individuellement. Pour un ensemble de pieds de BUBINGA destinés à la récolte, pour la prochaine AAC, cette formule est utilisée pour la prévision du potentiel de récolte BUBINGA dans la prochaine AAC. On obtient ainsi, pour la prévision du volume à récolter pour une récolte de N pieds de BUBINGA (appartenant à diverses classes de diamètres au-dessus du DME) :

$$V_{récolté,total} = \sum_{i=1}^{N}(B_{UFA} + A_{UFA}V_{estimé,DHP_i})$$

Équation qui se transforme en, A_{ufa} et B_{ufa} étant des constantes :

$$V_{récolté,total} = NB_{UFA} + A_{UFA}\sum_{i=1}^{N} V_{estimé,DHP_i}$$

Il est à noter que le N ci-dessus est la somme des N_i individuels des nombres de pieds de BUBINGA autorisés à la récolte par classe de diamètre (>DME). Il est aussi à noter que $\sum_{i=1}^{N} V_{estimé,DHP_i}$ représente en fait le potentiel de récolte.

Pour prendre en compte le taux de récolte défini ci-dessus, en vue de définir à partir du potentiel de récolte un quota de récolte, la formule ci-dessus est transformé en, pour les besoins du calcul seulement, en :

$$V_{récolté,quota} = N\Omega_{UFA}B_{UFA} + A_{UFA}(\Omega_{UFA}\sum_{i=1}^{N} V_{estimé,DHP_i})$$

Et cette dernière équation pourrait s'écrire simplement :

$$V_{récolté,quota} = N\Omega_{UFA}B_{UFA} + A_{UFA}QR_{UFA}$$

Sur la base du quota de récolte dans une UFA donnée, dans la prochaine AAC, il est obtenu une formule « analytique » qui donne une prévision du volume total à récolter.

Pour ce qui est du quota de récolte résiduel (QRR_{UFA}) dans la précédente AAC, et en l'absence de données détaillées des pieds récoltées tel que présenté dans la section correspondante ci-dessus, il est calculé selon l'approche empirique. Sinon il est calculé avec la formule analytique ci-dessus dans laquelle N est remplacé par ΔN et QR_{ufa} par ΔQR_{ufa}(représentant le volume résiduel sur pied du quota attribué dans la précédente AAC)

Il est aussi obtenu, comme dans l'approche empirique, les valeurs de :

- Rendement-matière historique de valorisation par l'usine des approvisionnements en grumes de BUBINGA ;
- Rendement-matière historique de façonnage des billes de BUBINGA au parc forêt de l'UFA ;

CALCUL DU QUOTA « LOCAL » DE DÉBITÉS (POUR UNE USINE ALIMENTÉE PAR K UFA)

Le quota de débités est calculé selon la formule :

$$QD_{usine,UFA} = RM_{hist,usine} RM_{hist,façon,ufa} \xi_i \beta_1 V_{récolté,quota,ufa} + \xi_i TT_{transf,ufa} (\beta_{0,Q} \mathrm{QRR}_{UFA} + \beta_{0,P} PRR_{UFA})$$

Le quota de débités d'une usine approvisionnée par k UFA, en prenant en compte les considérations ci-dessus sur le quota de débités d'un couple usine-UFA, est calculé selon la formule :

$$QD_{usine} = \sum_{UFA_1}^{UFA_k} QD_{usine,UFA_i}$$

h) Quota national de débités

Le quota national est la somme des quotas locaux des usines auxquelles des quotas de débités auront été accordés. Il sera publié chaque année deux quotas nationaux :

- L'un basé sur la réalité de l'historique du commerce des débités de BUBINGA par les transformateurs ayant une historique de transformation de BUBINGA et sollicitant des quotas de débités pour la prochaine année ; ce quota national est celui qui prend en compte toutes les considérations ci-dessus sur la détermination du Quota de Récolte Total (QRT) dans chaque UFA identifiée comme approvisionnant un transformateur sollicitant un quota de débités (quota de récolte total, prenant en compte autant la nouvelle AAC que la précédente) ;

- L'autre basé sur le Potentiel de BUBINGA dans les UFA partenaires des transformateurs sollicitant des quotas de débités. Ce quota est donc un plafond qui ne peut être atteint compte tenu des considérations commerciales et scientifiques qui sont proposés pour déterminer les quotas de récolte dans les UFA. Ce « quota » de débités « plafond » est en fait le gisement de richesses de BUBINGA (en termes de débités) disponible dans les forêts de production de l'aire de répartition de BUBINGA .

Situation combinée aux données sur les quotas de Guibourtia tessmmanii dans la période indiquée au Cameroun ainsi qu'il suit :

Société	Titre	Potentiel de récolte	Quota attribué	Quota de produits transformés	
				Grumes	Plots
SEPFCO	00-001	56	42	1,98	33,93
CFK	09-022	41	30,75	1,45	24,84
FC Mvangane	1491	39	29,25	1,38	23,63
FC AkomII ET Efoulan	1485	20	20	0,94	16,15
FC Akom II ET Efoulan	1485	167	125,25	5,92	101,19
FC N-N-N	1496	39	29,25	1,38	23,63
Commune de Mvengue	1498	291	218,25	10,31	176,34
Total		**653**	**494,75**	**23,36**	**399,71**

Tableau1 : Année 2017

Société	Titre	Potentiel de récolte	Quota attribué	Quota de produits transformés		
				Grumes	Plots	Débités
Marelis	10-062	277	207,75	9,81	167,85	
SEFECCAM	11-002	276	207	9,78	167,25	
SEPFCO	00-001	124	93	4,39	75,14	
GIC Oyili Nyabitande	FC 255	118	118			52,4
Total		**795**	**625,75**	**23,98**	**410,2**	**52,4**

Tableau 2 : Année 2018

Société	Titre	Potentiel de récolte	Quota attribué	Quotas de débités
SABE	VC 903451	95,6167	19,1233	8,63
Commune MVANGAN	FCle MVANGAN	1391,75	500,001	221,685
Total		**1487,3667**	**519,1243**	**230,315**

Tableau 3 : Année 2019

Société	Titre	Potentiel de récolte	Quota attribué	Quotas de débités
SFE	UFA 09022	2 337,86	502,64	201,06
	Fcle De Mengong et de Biwong-Bulu	297,19	52,01	20,80
Total		**2 635,04**	**554,65**	**221,86**

Tableau 4 : Année 2020

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Société	Titre	Potentiel de récolte	Quota attribué	Quotas de débités
COFA	FCle Mvangan	2 924,26	1 315,92	460,57060
	UFA 09031	2 227,55	1 269,70	444,39597
	UFA 09016	3 273,18	1 865,71	652,99868
Total		**8 424,98281**	**4 451,32927**	**1 557,96524**

Tableau 5 : Année 2021

V- CONCLUSION

Il ressort de ces tableaux que en ce qui concerne le *Guibourtia tessmmanii* , le Cameroun pour la période indiquée (2017-2021) a cumulé un potentiel de récolte sur pied estimé à prés de 1399**4m**^{3} et l'Autorité scientifique a approuvé un quota de 6644m^3 représentant 50% du potentiel sur pied. Si le quota tel qu'approuvé par l'autorité scientifique a été réalisée, on pourrait admettre que le Cameroun a mis une moyenne de 1300m^3/an de *Guibourtia tessmmanii* dans le commerce international pour la période retenue dans le cadre de cette étude du commerce important. Aussi, il est à noter que, la gestion de la rareté de cette espèce a conduit à considérer un Diamètre Minimum d'Exploitabilité (DME) à 110 cm à la différence des autres Guibourtia dont le DME se situe à 90cm. Le modèle de gestion des espèces de flore arborescente développé au niveau de l'autorité scientifique CITES flore du Cameroun permis d'avoir une maitrise sur l'ensemble des paramètres de gestion et régulation des quantités d' espères d'arbres inscrites à l'annexe II de la CITES en général et *Guibourtia spp* en particulier. Ce modèle de gestion des espèces arborescentes CITES inscrites à l'annexe II permet de se conformer aux dispositions de l'article IV, paragraphe 2(a), 3 et 6(a) concernant l'exportation de *Guibourtia tessmanni*. Les résultats obtenus ont été présentés en marge de la COP17 à Johannesburg et il constitue actuellement une étude de cas dans le processus en cours de révision du mécanisme de l'avis de commerce non préjudiciable (ACNP), ceci conformément aux dis positions des décisions 19.102 et 19.103 portant sur la révision des Avis de Commerce Non Préjudiciable (ACNP).

REPUBLIQUE DU CAMEROUN
Paix –Travail - Patrie

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REPUBLIC OF CAMEROON
Peace –Work – Fatherland

MINISTRY OF FORESTRY AND WILDLIFE

SECRETARIAT OF STATE

SECRETARIAT GENERAL

DEPARTMENT OF FORESTRY

RAPPORT SUR LA GESTION DE BUBINGA 2017, 2018, 2019 et 2020

1.1 Rapport sur les exportations de Bubinga par société en 2017

	SOCIETES	TITRE	DESTINATION	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
1.	SEFECCAM	UFA 00 004 AC 5-3	USA	21,471	P1Q2017	21,471
2.	SEFECCAM	UFA 00 004 AC 5-3	Allemagne	40,757	P2Q2017	62,228
3.	SEFECCAM	UFA 00 004 AC 5-3	USA	24,350	P3Q2017	86,578
4.	SO BO CA	UFA 09 015 AC4-1	Suisse	120	P4Q2017	206,578
5.	FIP CAM		Vietnam	56,446	P5Q2017	263,024
6.	CUF	UFA 09 019 AC4-1	Italie	19,192	P6Q2017	278,216
7.	CUF	UFA 09019 AC4-1	Chine	36,208	P7Q2017	314,424
8.	CUF	UFA 09 019 AC4-1	Chine	141,814	P8Q2017	456,238
9.	SEDB		Chine	50,000	P9Q2017	506,238
10.	LOGISWOUDS		Chine	38,122	P10Q2017	544,360
11.	LOGISWOUDS		Chine	37,795	P11Q2017	582,155
12.	LOGISWOUDS		Chine	34,075	P12Q2017	616,230
13.	LOGISWOUDS		Chine	110,000	P13Q2017	726,230
14.	SEFECCAM	UFA 00 004 AC 5-3	USA	20,909	P14Q2017	747,139
15.	SEDB	UFA 09 016	Chine	56,164	P15Q2017	803,303
16.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II	Chine	100,000	P16Q2017	903,303
17.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II	Chine	100,000	P17Q2017	1003,303
18.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II	Chine	100,000	P18Q2017	1103,303
19.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II	Chine	100,000	P19Q2017	1203,303
20.	STBC	UFA 09 016 AC3-3	Chine	60,000	P20Q2017	1263,303
21.	STBC	UFA 09 016 AC3-3	Chine	60	P21Q2017	1323,303
22.	STBC	UFA 09 016 AC3-3	Chine	60	P22Q2017	1383,303
23.	STBC	UFA 09 016 AC3-3	Chine	60	P23Q2017	1443,303
24.	STBC	UFA 09 016 AC3-3	Chine	37	P24Q2017	1480,303
25.	STBC	UFA 09 016 AC3-3	Chine	37	P25Q2017	1517,303
26.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II AC 1-1	Chine	200,000	P26Q2017	1717,303
27.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II AC 1- 1	Chine	200,000	P27Q2017	1917,303
28.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II AC 1- 1	Chine	200	P28Q2017	2117,303
29.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II AC 1- 1	Chine	200	P29Q2017	2317,303
30.	SEXTRANSBOIS	Fcle BIPINDI & AKOM II AC 1- 1	Chine	200	P30Q2017	2517,303
31.	Jerun & Cie		Chine	200	P31Q2017	2717,303
32.	Jerun & Cie		Chine	200	P32Q2017	2917,303
33.	Jerun & Cie		Chine	200	P33Q2017	3117,303
34.	Jerun & Cie		Chine	200	P34Q2017	3317,303
35.	Jerun & Cie		Chine	200	P35Q2017	3517,303
36.	SFD	Fcle AMBAM AC 1-3	Chine	101,943	P36Q2017	3619,246
37.	SFD	Fcle AMBAM AC 1-3	Chine	102,02	P37Q2017	3721,266
38.	SFD	Fcle AMBAM AC 1-3	Chine	102,623	P38Q2017	3823,889
39.	SFD	Fcle AMBAM AC 1-3	Chine	103,116	P39Q2017	3927,005

	SOCIETES	TITRE	DESTINATION	VOLUME (m³)	N° REF QUOTA	Cumul au QUOTA
40.	GENINFO	Fcle AMBAM AC 1-3	Chine	101,775	P40Q2017	4028,780
41.	GENINFO	Fcle AMBAM AC 1-3	Chine	102,617	P41Q2017	4131,397
42.	GENINFO	Fcle AMBAM AC 1-3	Chine	100,336	P42Q2017	4231,733
43.	GENINFO	Fcle AMBAM AC 1-3	Chine	101,004	P43Q2017	4332,737
44.	GENINFO	Fcle AMBAM AC 1-3	Chine	101,079	P44Q2017	4433,816
45.	GENINFO	Fcle AMBAM AC 1-4	Chine	102,302	P45Q2017	4536,162
46.	GENINFO	Fcle AMBAM AC1-4	Chine	100,587	P46Q2017	4636,749
47.	GENINFO	Fcle AMBAM AC1-4	Chine	108,917	P47Q2017	4745,666
48.	GENINFO	SOBOCA 09 015 AC4-4	Chine	108,938	P48Q2017	4854,604
49.	GENINFO	SOBOCA 09 015 AC4-4	Chine	100,487	P49Q2017	4955,091
50.	GENINFO	SOBOCA 09 015 AC4-4	Chine	100,199	P50Q2017	5055,290
51.	GENINFO	SOBOCA 09 015 AC4-4	Chine	100,278	P51Q2017	5155,568
52.	GENINFO	SOBOCA 09 015 AC4-4	Chine	100,309	P52Q2017	5255,877
53.	SEFECCAM	UFA 00 004 AC 5-3	Chine	85,576	P53Q2017	5341,453
54.	GENINFO	UFA 1487 AC1-3	Chine	100,114	P54Q2017	5441,567
55.	GENINFO	UFA 1487 AC1-3	Chine	100,062	P55Q2017	5541,629
56.	GENINFO	UFA 1487 AC1-3	Chine	100,161	P56Q2017	5641,790
	TOTAL			**5 641,790**		

Le Cameroun a délivré 56 permis CITES pour l'exportation de **5 641,790 m³** de débités de Bubinga sur les **6 872,65 m³** qui étaient autorisés comme quota du Cameroun en 2017.

1.2 Rapport sur les exportations de Bubinga par société en 2018

	SOCIETES	TITRES	DESTINATIONS	VOLUME (m³)	N° REF QUOTA	Cumul au QUOTA
1.	CUF	UFA 09 019 AC 5-2	Italie	28,659	P1Q2018	28,659
2.	CUF	UFA 090 023 AC4-4,UFA09 029A AC1 UFA 09 019 AC5-2	Chine	121,687	P2Q2018	150,346
3.	CUF	UFA 090 023 AC4-4,UFA09 029A AC1 UFA 09 019 AC5-2	Chine	30,607	P2bisQ2018	180,953
4.	CUF	UFA 09 019 AC 5-2	France	18,840	P3Q2018	199,793
5.	CUF	UFA 09 019 AC 5-2	Belgique	21,387	P4Q2018	221,180
6.	CUF	UFA 09 019 AC 5-2	Belgique	50,132	P5Q2018	271,312
7.	SO BO CA	UFA 09 015 AC4-3	Turquie	80	P6Q2018	351,312
8.	CUF	UFA 09 019 AC 5-2	Italie	18,299	P7Q2018	369,611
9.	CUF	UFA 09 023 AC4-4	Japon	39,211	P8Q2018	408,822
10.	CUF	UFA 09 019 AC 5-2	Chine	86,988	P9Q2018	495,810
11.	SEDB	09 016 AC3-4	Chine	150,000	P10Q2018	645,810
12.	SEFECCAM	UFA 00 004 AC 1-1	Etats Unis	20,487	P11Q2018	666,297
13.	SEFECCAM	UFA 00 004 AC 1-1	Etats Unis	20,414	P12Q2018	686,711
14.	SEFECCAM	UFA 00 004 AC 1-1	Thailande	16,913	P13Q2018	703,624
15.	SFE	UFA 00 001 AC 3-2 3-3	Chine	55,500	P14Q2018	759,124
16.	SFE	UFA 00 001 AC 3-2 3-3	Chine	55,500	P15Q2018	814,624
17.	SFE	UFA 00 001 AC 3-2 3-3	Chine	55,500	P16Q2018	870,124
18.	SFE	UFA 00 001 AC 3-2 3-3	Chine	37,000	P17Q2018	907,124
19.	COFA	UFA 09 030 AC 1-1	Chine	250	P18Q2018	1157,124
20.	COFA	UFA 09 030 AC 1-1	Chine	250	P19Q2018	1407,124
21.	COFA	UFA 09 030 AC 1-1	Chine	250	P20Q2018	1657,124

	SOCIETES	TITRES	DESTINATIONS	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
22.	COFA	UFA 09 030 AC 1-1	Chine	250	P21Q2018	1907,124
23.	SEDB	UFA 09 015 AC4-3	Chine	20,692	P22Q2018	1927,816
24.	SEDB	UFA 09 015 AC4-3	Chine	20,692	P23Q2018	1948,508
25.	SEDB	UFA 09 015 AC4-3	Chine	20,692	P24Q2018	1969,200
26.	COFA	UFA 09 030 AC 1-1	Chine	250	P25Q2018	2219,200
27.	COFA	UFA 09 030 AC 1-1	Chine	250	P26Q2018	2469,200
28.	COFA	UFA 09 030 AC 1-1	Chine	250	P27Q2018	2719,200
29.	COFA	UFA 09 030 AC 1-1	Chine	250	P28Q2018	2969,200
30.	Jerun & Cie	Fcnale Ambam AC 1-4	Shanghai	100	P29Q2018	3069,200
31.	Jerun & Cie	Fcnale Ambam AC 1-4	Shanghai	100	P30Q2018	3169,200
32.	Jerun & Cie	Fcnale Ambam AC 1-4	Shanghai	200	P31Q2018	3369,200
33.	Jerun & Cie	Fcnale Ambam AC 1-4	Shanghai	200	P32Q2018	3569,200
34.	Jerun & Cie	Fcnale Ambam AC 1-4	Shanghai	200	P33Q2018	3769,200
35.	Jerun & Cie	Fcnale Ambam AC 1-4	VIETNAM	100	P34Q2018	3869,200
36.	Jerun & Cie	Fcnale Ambam AC 1-4	VIETNAM	100	P35Q2018	3969,200
37.	Jerun & Cie	Fcnale Ambam AC 1-4	VIETNAM	100	P36Q2018	4069,200
38.	Jerun & Cie	Fcnale Ambam AC 1-4	VIETNAM	100	P37Q2018	4169,200
39.	SFD	FC 1487 AC 1-5	Chine	102,377	P38Q2018	4271,577
40.	SFD	FC 1487 AC 1-5	Chine	102,448	P39Q2018	4374,025
41.	SFD	FC AMBAM AC 1-4	Chine	20,512	P40Q2018	4394,537
42.	SFD	FC AMBAM AC 1-4	Chine	20,331	P41Q2018	4414,868
43.	SFD	FC AMBAM AC 1-4	Chine	20,733	P42Q2018	4435,601
44.	SFD	FC AMBAM AC 1-4	Chine	41,678	P43Q2018	4477,279
45.	SFD	FC AMBAM AC 1-4	Chine	102,238	P44Q2018	4579,517
46.	SFD	FC AMBAM AC 1-4	Chine	101,804	P45Q2018	4681,321
47.	SFD	FC AMBAM AC 1-4	Chine	20,331	P46Q2018	4701,652
48.	SFD	FC AMBAM AC 1-4	Chine	102,127	P47Q2018	4803,779
49.	SFD	FC AMBAM AC 1-5	Chine	203,035	P48Q2018	5006,814
50.	SFD	FC AMBAM AC 1-6	Chine	203,123	P49Q2018	5209,937
51.	Ets SUNWOOD	UFA 1487 AC 1-4	Chine	22,531	P50Q2018	5232,468
52.	Ets SUNWOOD	UFA 1487 AC 1-4	Chine	22,323	P51Q2018	5254,791
53.	Ets SUNWOOD	UFA 1487 AC 1-4	Chine	22,205	P52Q2018	5276,996
54.	Ets SUNWOOD	UFA 1487 AC 1-4	Chine	22,023	P53Q2018	5299,019
55.	Ets SUNWOOD	UFA 1487 AC 1-4	Chine	22,307	P54Q2018	5321,326
		TOTAL		5321,326		

Le Cameroun a délivré 55 permis CITES pour l'exportation de **5321,326 m³** de débités de Bubinga sur les **5 493,55** m³ qui étaient autorisés comme quota du Cameroun en 2018.

1.3 Rapport sur les exportations de Bubinga par sociétés en 2019

	SOCIETES	TITRES	DESTINATION	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
1.	ETS MEV	UFA 00 001 AC 3-4	Chine	55,5	P1Q2019	55,5
2.	ETS MEV	UFA 00 001 AC 3-4	Chine	37	P2Q2019	92,5
3.	ETS MEV	UFA 00 001 AC 3-4	Chine	37	P3Q2019	129,5
4.	ETS MEV	UFA 00 001 AC 3-4	Chine	18,5	P4Q2019	148
5.	ETS MEV	UFA 00 001 AC 3-4	Chine	55,5	P5Q2019	203,5

	SOCIETES	TITRES	DESTINATION	VOLUME (m³)	N° REF QUOTA	Cumul au QUOTA
6.	ETS MEV	UFA 00 001 AC 3-4	Chine	37	P6Q2019	240,5
7.	ETS MEV	UFA 00 001 AC 3-4	Chine	18,5	P7Q2019	259
8.	ETS MEV	UFA 00 001 AC 3-5	Chine	61	P8Q2019	320
9.	ETS MEV	UFA 00 001 AC 3-6	Chine	39	P9Q2019	359
10.	ETS MEV	UFA 00 001 AC 3-7	Chine	42	P10Q2019	401
11.	ETS MEV	UFA 00 001 AC 3-8	Chine	42	P11Q2019	443
12.	ETS MEV	UFA 00 001 AC 3-9	Chine	42	P12Q2019	485
13.	ETS MEV	UFA 00 001 AC 3-10	Chine	42	P13Q2019	527
14.	ETS MEV	UFA 00 001 AC 3-11	Chine	41	P14Q2019	568
15.	ETS MEV	UFA 00 001 AC 3-12	Chine	21	P15Q2019	589
16.	ETS MEV	UFA 00 001 AC 3-13	Chine	21	P16Q2019	610
17.	SFD	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	81,223	P17Q2019	691,223
18.	SFD	Fcle MENGONG et BIWONG BULU AC 1-3	Thailande	22,008	P18Q2019	713,231
19.	KN &CO	UFA 09 015 AC 4-4 4-5	Chine	35	P19Q2019	748,231
20.	KN &CO	UFA 09 015 AC 4-4 4-5	Chine	85	P20Q2019	833,231
21.	KN &CO	UFA 09 015 AC 4-4 4-5	Chine	65	P21Q2019	898,231
22.	KN &CO	UFA 09 015 AC 4-4 4-5	Chine	65	P22Q2019	963,231
23.	SFD	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	46,326	P23Q2019	1009,557
24.	SFD	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	41,319	P24Q2019	1050,876
25.	SFDB	UFA 09 015 AC 4-5	Chine	90	P25Q2019	1140,876
26.	LOGISWOODS	UFA 00 001 AC3-4	Chine	40,217	P25Q2019	1091,093
27.	LOGISWOODS	UFA 00 001 AC3-5	Chine	40,134	P26Q2019	1131,227
28.	LOGISWOODS	UFA 00 001 AC3-6	Chine	39,976	P27Q2019	1171,203
29.	LOGISWOODS	UFA 00 001 AC3-7	Chine	79,673	P28Q2019	1250,876
30.	SFE	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	80	P29Q2019	1330,876
31.	SFE	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	80	P30Q2019	1410,876
32.	SFE	Fcle MENGONG et BIWONG BULU AC 1-3	Chine	60	P31Q2019	1470,876
33.	ETS FRANCIS	UFA 09 015 AC4-4 4-5	Chine	50	P32Q2019	1520,876
34.	ETS FRANCIS	UFA 09 015 AC4-4 4-5	Chine	50	P33Q2019	1570,876
35.	ETS MEV	Fcle Mvangan AC 1-4	Chine	57	P34Q2019	1627,876
36.	ETS MEV	Fcle Mvangan AC 1-4	Chine	57	P35Q2019	1684,876
37.	ETS MEV	Fcle Mvangan AC 1-4	Chine	38	P36Q2019	1722,876
38.	ETS MEV	Fcle Mvangan AC 1-4	Chine	38	P37Q2019	1760,876
39.	ETS MEV	Fcle Mvangan AC 1-4	Chine	19	P38Q2019	1779,876
40.	SEFECCAM	UFA 00 004 AC1-2	Afrique du Sud	13,691	P39Q2019	1793,567
41.	STB	UFA 09 015 AC4-4 4-5	Chine	50	P40Q2019	1843,567
42.	STB	UFA 09 015 AC4-4 4-5	Chine	50	P41Q2019	1893,567
43.	STB	UFA 09 015 AC4-4 4-5	Chine	50	P42Q2019	1943,567
44.	LOGISWOODS	AEEB N°517	Chine	60	P43Q2019	2003,567
45.	LOGISWOODS	AEEB N°517	Chine	60	P44Q2019	2063,567
46.	LOGISWOODS	AEEB N°517	Chine	60	P45Q2019	2123,567
47.	LOGISWOODS	AEEB N°517	Chine	60	P46Q2019	2183,567
48.	LOGISWOODS	AEEB N°517	Chine	60	P47Q2019	2243,567
49.	SEFECCAM	UFA 00 004 AC1-2	Etats Unis	19,937	P48Q2019	2263,504

	SOCIETES	TITRES	DESTINATION	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
50.	CUF	UFA 09 026 AC3-2	Chine	69,39	P49Q2019	2332,894
51.	LOGISWOODS	UFA 09 015 AC4-5	CHINE	60	P50Q2019	2392,894
52.	LOGISWOODS	UFA 09 015 AC4-5	CHINE	60	P51Q2019	2452,894
53.	LOGISWOODS	UFA 09 015 AC4-5 4-4	CHINE	60	P52Q2019	2512,894
54.	LOGISWOODS	UFA 09 015 AC4-4	CHINE	60	P53Q2019	2572,894
55.	LOGISWOODS	UFA 09 015 AC4-4	CHINE	60	P54Q2019	2632,894
56.	STBC	UFA 09 015 AC4-5	CHINE	40	P55Q2019	2672,894
57.	STBC	UFA 09 015 AC4-5	CHINE	60	P56Q2019	2732,894
58.	STBC	UFA 09 015 AC4-4	CHINE	43	P57Q2019	2775,894
59.	STBC	UFA 09 015 AC4-4	CHINE	43	P58Q2019	2818,894
60.	SEFECCAM	UFA 00 004 AC1-2	Thailande	12,869	P59Q2019	2831,763
61.	SEDB	UFA 00 001 AC 3-3	Chine	18	P60Q2019	2849,763
62.	SEDB	UFA 00 001 AC 3-3	Chine	18	P61Q2019	2867,763
63.	SEDB	UFA 00 001 AC 3-3	Chine	18	P62Q2019	2885,763
64.	SEDB	UFA 00 001 AC 3-3	Chine	18	P63Q2019	2903,763
65.	SEDB	UFA 00 001 AC 3-3	Chine	18	P64Q2019	2921,763
66.	SEDB	UFA 00 001 AC 3-4	Chine	85	P65Q2019	3006,763
67.	SEDB	UFA 00 001 AC 3-4	Chine	15	P66Q2019	3021,763
68.	ETS MEV	FC MVANGAN AC 1-4	Chine	57	P67Q2019	3078,763
69.	ETS MEV	FC MVANGAN AC 1-4	Chine	57	P68Q2019	3135,763
70.	ETS MEV	FC MVANGAN AC 1-4	Chine	38	P69Q2019	3173,763
71.	ETS MEV	FC MVANGAN AC 1-4	Chine	38	P70Q2019	3211,763
72.	ETS MEV	FC MVANGAN AC 1-4	Chine	19	P71Q2019	3230,763
73.	SEXTRANSBOIS	UFA 1006 AC2	Chine	200	P72Q2019	3430,763
74.	SEXTRANSBOIS	UFA 1006 AC2	Chine	200	P73Q2019	3630,763
75.	SEDB	UFA 00 001 AC 3-4	JAPON	10,242	P74Q2019	3641,005
76.	SEFECCAM	UFA 00 004 AC1-2	Chine	103,555	P75Q2019	3744,560
77.	ETS MEV	UFA 09 022 AC 3-1	Chine	60	P76Q2019	3804,560
78.	ETS MEV	UFA 09 022 AC 3-1	Chine	60	P77Q2019	3864,560
79.	ETS MEV	UFA 09 022 AC 3-1	Chine	60	P78Q2019	3924,560
80.	ETS MEV	UFA 09 022 AC 3-1	Chine	40	P79Q2019	3964,560
81.	ETS MEV	UFA 09 022 AC 3-1	Chine	40	P80Q2019	4004,560
82.	ETS MEV	UFA 09 022 AC 3-1	Chine	20	P81Q2019	4024,560
83.	ETS MEV	UFA 09 022 AC 3-1	Chine	20	P82Q2019	4044,560
84.	SFE	UFA 09 022 AC 3-1	Chine	60	P83Q2019	4104,560
85.	SFE	UFA 09 022 AC 3-1	Chine	60	P84Q2019	4164,560
86.	SFE	UFA 09 022 AC 3-1	Chine	60	P85Q2019	4224,560
87.	SFE	UFA 09 022 AC 3-1	Chine	40	P86Q2019	4264,560
88.	SFE	UFA 09 022 AC 3-1	Chine	40	P87Q2019	4304,560
89.	SFE	UFA 09 022 AC 3-1	Chine	20	P88Q2019	4324,560
90.	SFE	UFA 09 022 AC 3-1	Chine	20	P89Q2019	4344,560
91.	FIPCAM	UFA 09 017 AC 4-2	USA	18,664	P90Q2019	4363,224
92.	BWBC	AEEB N°1093	Chine	61,025	P91Q2019	4424,249
93.	LOGISWOODS	Fcle AMBAM AC 3-4	Chine	65	P92Q2019	4489,249
94.	LOGISWOODS	Fcle AMBAM AC 3-4	Chine	43	P93Q2019	4532,249
95.	LOGISWOODS	Fcle AMBAM AC 3-4	Chine	42	P94Q2019	4574,249
96.	LOGISWOODS	UFA 00 001 AC 3-4	Chine	85	P95Q2019	4659,249
97.	ETS MEV	UFA 09 022 AC 3-1	Chine	60	P96Q2019	4719,249
98.	ETS MEV	UFA 09 022 AC 3-1	Chine	60	P97Q2019	4779,249
99.	ETS MEV	UFA 09 022 AC 3-1	Chine	40	P98Q2019	4819,249
100.	ETS MEV	UFA 09 022 AC 3-1	Chine	40	P99Q2019	4859,249
101.	ETS MEV	UFA 09 022 AC 3-1	Chine	20	P100Q2019	4879,249

	SOCIETES	TITRES	DESTINATION	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
102.	SEFECCAM	UFA 00 004 AC 1-2	CHINE	81,028	P101Q2019	4960,277
103.	SEFECCAM	UFA 00 004 AC 1-2	Etats Unis	25,266	P102Q2019	4985,543
104.	JERUN & Cie	UFA 09 030 AC 2	Chine	250	P103Q2019	5235,543
105.	JERUN & Cie	UFA 09 030 AC 2	Chine	250	P104Q2019	5485,543
106.	SEFECCAM	UFA 00 004 AC1-2	Etats Unis	24,61	P105Q2019	5510,153
107.	SEFECCAM	UFA 00 004 AC1-2	Etats Unis	24,766	P106Q2019	5534,919
108.	STB	UFA 09 015	Chine	44	P107Q2019	5578,918
109.	**STB**	UFA 09 015 AC4-4	Chine	40	P108Q2019	5618,918
		TOTAL		**5618,918**		

Le Cameroun a délivré 109 permis CITES pour l'exportation de **5618,918 m³** de débités de Bubinga sur les **5 817,67 m³** qui étaient autorisés comme quota du Cameroun en 2019.

1.4 Rapport des exportations de Bubinga par société en 2020.

	SOCIETES	TITRES	DESTINATION	VOLUME (m^3)	N° REF QUOTA	Cumul au QUOTA
1.	CUF	UFA 10 026 AC 3-4	Chine	94,486	P1Q2020	94,486
2.	SEFECCAM	UFA 00 004 AC 1-3	JAPON	16,018	P2Q2020	110,504
3.	ETS MEV	UFA 09 022 AC 3-2	Chine	40	P3Q2020	150,504
4.	ETS MEV	UFA 09 022 AC 3-2	Chine	40	P4Q2020	190,504
5.	ETS MEV	UFA 09 022 AC 3-2	Chine	40	P5Q2020	230,504
6.	JERUN & Cie	UFA 09 031 AC 1	Chine	200	P6Q2020	430,504
7.	JERUN & Cie	UFA 09 031 AC 1	Chine	200	P7Q2020	630,504
8.	JERUN & Cie	UFA 09 031 AC 1	Chine	250	P8Q2020	880,504
9.	JERUN & Cie	UFA 09 031 AC 1	Chine	250	P9Q2020	1130,504
10.	SEFECCAM	UFA 00 004 AC 1-3	JAPON	9,037	P10Q2020	1139,541
11.	SEFECCAM	UFA 00 004 AC 1-3	Thailande	19,122	P11Q2020	1158,663
12.	SEFECCAM	UFA 00 004 AC 1-3	Chine	225,567	P12Q2020	1384,23
13.	SFE	UFA 09-022 AC3-2	Chine	44,5	P13Q2020	1428,73
14.	SFE	UFA 09-022 AC3-2	Chine	44,5	P14Q2020	1473,23
15.	SFE	UFA 09-022 AC3-2	Chine	66,7	P15Q2020	1539,93
16.	SFE	UFA 09-022 AC3-2	Chine	66,7	P16Q2020	1606,63
17.	MEV	UFA 09-022 AC3-2	Chine	44,5	P17Q2020	1651,13
18.	MEV	UFA 09-022 AC3-2	Chine	44,5	P18Q2020	1695,63
19.	MEV	UFA 09-022 AC3-2	Chine	66,7	P19Q2020	1762,33
20.	MEV	UFA 09-022 AC3-2	Chine	66,7	P20Q2020	1829,03
21.	SEFECCAM	UFA 00 004 AC 1-3	Thailande	70,439	P21Q2020	1899,469
22.	STB	UFA 09 015 AC4-5	Chine	40	P22Q2020	1939;469
23.	STB	UFA 09 015 AC4-5	Chine	40	P23Q2020	1979,469
24.	SFE	UFA 09 022 AC 3-3	Chine	44,5	P24Q2020	2023,969
25.	SFE	UFA 09 022 AC 3-3	Chine	44,5	P25Q2020	2068,469
26.	SFE	UFA 09 022 AC 3-3	Chine	44,5	P26Q2020	2112,969
27.	SFE	UFA 09 022 AC 3-3	Chine	44,5	P27Q2020	2157,469
28.	ETS MEV	UFA 09 022 AC 3-3	Chine	44,5	P28Q2020	2201,969

	SOCIETES	TITRES	DESTINATION	VOLUME (m³)	N° REF QUOTA	Cumul au QUOTA
29.	ETS MEV	UFA 09 022 AC 3-3	Chine	44,5	P29Q2020	2246,469
30.	ETS MEV	UFA 09 022 AC 3-3	Chine	44,5	P30Q2020	2290,969
31.	ETS MEV	UFA 09 022 AC 3-3	Chine	44,5	P31Q2020	2335,469
32.	JERUN & Cie	UFA 09 016 AC3-5	Chine	90	P32Q2020	2425,469
33.	JERUN & Cie	UFA09 030	Chine	110	P33Q2020	2535,469
34.	CUF	UFA 09 026 AC3-4	Chine	22,896	P34Q2020	2558,365
35.	SEDB	CVEB	Chine	22	P35Q2020	2580,365
36.	SEDB	CVEB	Chine	22	P36Q2020	2602,365
37.	JERUN & CIE Sarl	UFA 09 031 AC 1	Chine	200	P37Q2020	2802,365
38.	JERUN & CIE Sarl	UFA 09 031 AC 1	Chine	200	P38Q2020	3002,365
39.	JERUN & CIE Sarl	UFA 09 031 AC 1	Chine	200	P39Q2020	3202,365
40.	JERUN & CIE Sarl	UFA 09 031 AC 1	Chine	200	P40Q2020	3402,365
41.	CUF	UFA 09 026 AC3-4	Chine	94,822	P41Q2020	3497,187
42.	FIPCAM	UFA 09 017	USA	107,841	P42Q2020	3605,028
	TOTAL			**3605,028**		

Le Cameroun a délivré 42 permis CITES pour l'exportation d'un total **3605,028 m³** des débités de Bubinga sur les **4304,74 m³** qui étaient autorisés comme quota du Cameroun en 2020.

REPUBLIQUE DU CAMEROUN
Paix –Travail - Patrie

MINISTERE DES FORETS
ET DE LA FAUNE

SECRETARIAT D'ETAT

SECRETARIAT GENERAL

DIRECTION DES FORETS

BP 34430
Yaoundé
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REPUBLIC OF CAMEROON
Peace –Work – Fatherland

MINISTRY OF FORESTRY
AND WILDLIFE

SECRETARIAT OF STATE

SECRETARIAT GENERAL

DEPARTMENT OF FORESTRY

RAPPORT SUR LA GESTION DU BUBINGA 2021

Rapport sur les exportations du Bubinga par société et par titre en 2021

N°	SOCIETES	TITRES	DESTINATION	VOLUME (en m³)	N° REF QUOTA	Cumul au QUOTA
1	SEFECCAM	UFA 00 004	Chine	263,904	P1Q2021	263,904
2	CUF	UFA 09 019	Chine	33,791	P2Q2021	297,695
3	SEFECCAM	UFA 00 004	Etats Unis	16,427	P3Q2021	314,122
4	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P4Q2021	358,622
5	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P5Q2021	403,122
6	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P6Q2021	447,622
7	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P7Q2021	492,122
8	FIFCAM	UFA 09 017	USA	32,53	P8Q2021	524,652
9	CUF	UFA 09 023	VIETNAM	32,195	P9Q2021	556,847
10	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P10Q2021	601,347
11	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P11Q2021	645,847
12	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P12Q2021	690,347
13	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P13Q2021	734,847
14	CUF	UFA 09 023	Chine	36,454	P14Q2021	771,301
15	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P15Q2021	815,801
16	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P16Q2021	860,301
17	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P17Q2021	904,801
18	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P18Q2021	949,301
19	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P19Q2021	993,801
20	ETS MEV	UFA 1497 AC 1-5, AC 2-1	Chine	44,5	P20Q2021	1038,301
21	SEFECCAM	UFA 00 004	USA	49,589	P21Q2021	1087,89
22	SEFECCAM	UFA 00 004	CANADA	20,866	P22Q2021	1108,756
23	GENINFO	Fcle Ambam	Chine	100,22	P23Q2021	1208,976
24	GENINFO	Fcle Ambam	Chine	100,368	P24Q2021	1309,344

25	SOTEB	Fcle Ambam	VIETNAM	105,257	P25Q2021	1409,601
26	SOTEB	Fcle Ambam	VIETNAM	105,236	P26Q2021	1509,837
27	SOTEB	Fcle Ambam	VIETNAM	100,6	P27Q2021	1610,437
28	SOTEB	Fcle Ambam	VIETNAM	100,8	P28Q2021	1711,237
29	SOTEB	Fcle Mvangan	VIETNAM	100,5	P29Q2021	1811,737
30	GENINFO	Fcle Mvangan	VIETNAM	100,6	P30Q2021	1912,337
31	GENINFO	Fcle Mvangan	VIETNAM	100,8	P31Q2021	2013,137
32	GENINFO	Fcle Mvangan	VIETNAM	100,5	P32Q2021	2113,637
33	GENINFO	Fcle Mvangan	Chine	105,007	P33Q2021	2218,644

Le tableau ci-dessus présente l'état des exportations du Bubinga sur la base des permis émis. Une ligne correspond à l'enregistrement d'un permis CITES établi.

- La colonne « Société » renseigne le nom de l'entité forestière bénéficiaire du permis CITES et exportatrice du bois ;
- La colonne « Titres » renseigne le titre de provenance du bois à exporter ;
- La colonne « Destination » renseigne sur le pays importateur du bois ;
- La colonne « Volume en m3 » renseigne le volume de bois sollicité dans le permis CITES c'est-à-dire la quantité de bois voulant être exportée par l'entité forestière ;
- La colonne « N° Ref Quota » représente le numéro de référence pris par ledit permis CITES. Ce numéro est tout simplement égal à la concaténation de la lettre P qui signifie Permis + du numéro d'ordre du permis + de la lettre Q qui signifie Quota + de l'année du quota utilisé.
- La colonne « Cumul au quota » représente la somme cumulative des volumes sollicités dans les permis CITES émis sur le quota global établi l'année concernée.

Le Cameroun a délivré 33 permis CITES pour l'exportation de **2 218,644 m³** de débités du Bubinga sur les **4 180,23 m³** qui étaient autorisés comme quota du Cameroun en 2021 rendu au 31 Octobre 2023.

Récapitulatif des exportations par pays

DESTINATION	VOLUME TOTAL (en m³)	VOLUME (en %)
Chine	1262,744	56,66%
VIETNAM	846,488	37,98%
USA	82,119	3,68%
CANADA	20,866	0,94%
Etats Unis	16,427	0,74%
Total général	**2228,644**	**100,00%**

REPUBLIQUE DU CAMEROUN
Paix – Travail - Patrie

MINISTERE DES FORETS
ET DE LA FAUNE

SECRETARIAT D'ETAT

SECRETARIAT GENERAL

DIRECTION DES FORETS

BP 34430
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REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF FORESTRY
AND WILDLIFE

SECRETARIAT OF STATE

SECRETARIAT GENERAL

DEPARTMENT OF
FORESTRY

N° 4235 /L/MINFOF/SETAT/SG/DF/SDAFF/SN

Yaoundé le, 21 JUIL 2023

Ref : V/L N° DR/TC/RST/2023/CM du 19 juin 2023
M/L N°3695/L/MINFOF/SETAT/SG/DF/SDAFF/SN du 29 juin 2023

LE MINISTRE,

A

Madame le Secrétaire Général de la Convention sur le Commerce International des Espèces de Faune et de Flore Sauvages Menacées d'Extinction (CITES)

A l'attention de

Madame Thea Carroll, Cheffe de l'Unité Scientifique

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<u>Objet</u> : Etude du Commerce important de spécimens d'espèces inscrites à l'Annexe II [Résolution Conf.12.8 (Rev. Cop18)]

Madame le Secrétaire Général,

Comme suite aux correspondances citées en référence, relatives à l'objet repris en marge,

J'ai l'honneur de vous faire tenir ci-joint la réaction du Cameroun, conformément aux dispositions de la Résolution Conf.12.8 (Rev. COP 18).

Il convient de rappeler que le Cameroun fait partie intégrante des Etats de l'aire de distribution du *Guibortia tessmannii*. Au cours de la période indiquée, le Cameroun a exploité et exporté des quantités de cette essence, en s'assurant du respect des dispositions établies dans l'article 4.2 (a), 3 et 6. (a) de la Convention.

Aussi, nous plait-il de vous faire savoir que la gestion des espèces de flore arborescentes inscrites à l'annexe 2 de la CITES constitue une préoccupation constante des pouvoirs publics au Cameroun. Pour ce faire, un dispositif de gestion desdites espèces a été développé par l'autorité scientifique CITES flore et a permis de :

- renforcer les paramètres de gestion durable des espèces inscrites à l'annexe 2 de la CITES ;
- améliorer la fiabilité des prévisions de production forestière ;
- améliorer la fiabilité des prévisions de l'approvisionnement des marchés en produits transformés ;
- ajuster le niveau de production forestière à la performance commerciale historique (utilisation des attributs de récoltes antérieures).

En effet, ce modèle vise les objectifs ci-après :

- la sécurisation de la base de la ressource, pour les essences concernées en vue de l'approvisionnement soutenu et durable des marchés en produits transformés ;

- l'amélioration de la fiabilité des prévisions d'approvisionnement des unités de transformation ;
- l'amélioration de la fiabilité des prévisions de production des unités de transformation des essences inscrites à l'annexe 2 de la CITES ;
- la garantie qu'à l'échéance d'une année donnée, les quotas d'exportation des produits transformés sont réalisés à un taux d'au moins 90%.

Eu égard à ce qui précède et adressant le cas particulier du *Guibourtia tessmannii*, le Cameroun disposait d'un potentiel sur pied cumulé dans les titres ouverts à l'exploitation de 13 994 m³, pour la période considérée de l'étude du commerce important de cette essence (2017-2021). En appliquant le modèle de gestion sus évoqué, le quota de récolte approuvé au cours de cette période a été de 6 644 m³ (à peine 50%). Une posture de l'autorité scientifique reconnue très restrictive et contractée dans le but de se conformer aux dispositions de l'article 4.2(a), 3 et 6 (a) de la Convention.

Toute cette démarche est bien explicitée dans le document joint en annexe.

Je signale à toute fin utile que ce modèle de gestion fait actuellement l'objet de l'étude de cas dans le cadre de la mise en œuvre des décisions 19.102 et 19.103, portant révision du processus de formulation des Avis de Commerce Non Préjudiciable (ACNP).

Veuillez agréer, **Madame le Secrétaire Général**, l'expression de ma parfaite considération.

Le Ministre
The Minister

Jules Doret Ndongo

__Pièce jointe :__ Application de la Résolution Conf 12.8 (Rev.COP 18), étude du commerce important de *Guibourtia tessmannii*, espèce inscrite à l'annexe 2 de la CITES. **Réaction du Cameroun / ANAFOR, Juillet 2023**

__Copie__ :
- ANAFOR
- ENEF-Mbalmayo
- ISABEE (Université de Bertoua)

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTERE DES FORETS
ET DE LA FAUNE

SECRETAIRE D'ETAT

SECRETARIAT GENERAL

DIRECTION DES FORETS

REPUBLIC OF CAMEROON
Peace – Work – Fatherland

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CONVENTION SUR LE COMMERCE INTERNATIONAL DES ESPECES
DE FAUNE ET DE FLORE SAUVAGES MENACEES D'EXTINCTION

Soixante-dix-septième session du Comité permanent
Genève (Suisse), 6–10 novembre 2023

Respect de la Convention

APPLICATION DE L'ARTICLE XIII AU CAMEROUN

PROGRES DU CAMEROUN DANS LA GESTION DES ESPECES INSCRITES EN ANNEXE 2 DE LA CITES A TRAVERS LE DEVELOPPEMENT DU SYSTEME NATIONAL DE VERIFICATION DE LA LEGALITE ET LA DURABILITE DES QUOTAS D'EXPORTATION ETABLIS

Figure 1 : Codes à barres, générés par le Système Informatique de Gestion des Informations Forestière (SIGIF 2) sur les billes entreposées au parc

Novembre 2023

I. INTRODUCTION

Le Cameroun dispose du deuxième massif forestier d'Afrique après la République Démocratique du Congo. Soit environ 22,5 millions d'hectares. C'est le 5e rang africain du point de vue de la diversité biologique.

La loi forestière de 1994 vient réitérer la ferme volonté du Cameroun de prendre en main les préoccupations de la société camerounaise et de la communauté internationale vis à vis de la conservation de la nature et du concept de développement durable. En effet, bien avant la date de 1994, le Cameroun s'était déjà doté de plusieurs instruments juridiques au niveau international. Dans ce registre, figure en bonne place la Convention de Washington ou encore la Convention sur le Commerce International des Espèces de Faune et de Flore sauvages menacées d'extinction, connue sous le sigle CITES.

Le Gouvernement du Cameroun est conscient du fait que le sous-secteur forêt charrie diverses convoitises aussi bien sur le plan local, national qu'international, faisant peser sur lui d'importantes menaces dont celles de l'exploitation forestière et le commerce illégal.

Face à ces défis, le Cameroun reconnait que le commerce durable peut contribuer à la survie d'une espèce en lui conférant une valeur et en établissant par là même occasion, des incitations économiques visant à garantir son existence. La régulation du commerce international des espèces sauvage est un levier hautement stratégique du droit international et le Cameroun se félicite de son implication dans le cadre de la mise en œuvre de la CITES.

C'est à ce titre que toutes les questions en lien avec la mise en œuvre de l'article 13 de ladite Convention retiennent l'attention des décideurs politiques.

Les enjeux sont d'autant plus importants que depuis la COP 19 au Panama en novembre 2022, le Cameroun compte désormais plus de 17 espèces de flore inscrites en annexe 2 de la CITES contre 3 seulement avant cette période. Toutes ces espèces sont exploitables et d'intérêts pour diverses vocations. Au regard des enjeux socio-économiques, le respect des prescriptions de la CITES en matière de durabilité, de la légalité et de la traçabilité dans le commerce de ces espèces requiert désormais une attention particulière.

Heureusement, ces enjeux de plus en plus cruciaux s'inscrivent dans un contexte national avant-gardiste qui favorise pleinement la mise en œuvre du dispositif normatif de la CITES, malgré quelques contraintes. Un exemple concret de cette avancée est le renforcement du Système national de Vérification de la Légalité (SVL) grâce à la mise en place du Système Informatique de Gestion des Informations Forestières de 2ème génération (SGIF 2), opérationnel depuis le 1er avril 2021.

Le Cameroun adhère pleinement aux principes généraux des procédures de conformité énoncées dans la Résolution Conf. 14.3 de la CITES. La CITES privilégie une approche axée sur la collaboration plutôt que sur l'antagonisme pour garantir le respect à long terme de la Convention. Dans cette optique, toutes les mesures nécessaires sont prises pour favoriser la coopération, la concertation, et la communication avec le Secrétariat de la CITES ainsi qu'avec d'autres États parties. L'objectif de cette démarche est de promouvoir la transparence quant aux progrès accomplis par le Cameroun en matière de durabilité, de légalité et de traçabilité, tout en mettant en lumière les dispositifs en place pour gérer les espèces inscrites en annexe 2 de la CITES.

II. DURABILITE DES QUOTAS ETABLIS ET RENFORCEMENT DU SUIVI DES ESPECES

II.1 EVOLUTIONS METHODOLOGIQUE DANS L'ELABORATION DES AVIS DE COMMERCE NON PREJUDICIABLE (ACNP)

II.1.1 Choix du canevas d'élaboration des ACNP

Il existe une multitude d'approches méthodologiques pour formuler un ACNP. Le choix d'une méthode dépend du type des données disponibles. En tenant compte des notifications adressées au Cameroun par la CITES et les suggestions de l'union Européenne, le Cameroun a adopté le schéma de Cancun (2008) qui propose de formuler un ACNP en 05 étapes et qui est le mieux recommandé. Ce canevas permet de mettre en lumière la situation de la population ainsi que les mesures de gestion.

II.1.2 Méthodes de détermination des quotas

La philosophie sous-tendant la détermination des quotas repose sur le principe fondamental selon lequel ceux-ci doivent être établis en se basant sur le potentiel intrinsèque de la forêt, plutôt que sur des considérations préalables liées au marché. Dans cette optique, cette démarche s'appuie sur une analyse approfondie des données provenant des inventaires d'aménagement forestier et des inventaires d'exploitation. De plus, il convient de souligner que l'ACNP est rédigé pour l'espèce et non pour le genre. Ceci évite que les quotas du genre soient attribués à une seule espèce alors qu'ils soient expressifs de plusieurs espèces.

Par ailleurs, les nouveaux ACNP, dissocie le domaine permanent du domaine forestier non permanent. Pour tenir compte des éventuelles erreurs pouvant survenir lors des inventaires, des limitations inhérentes au contrôle forestier, ainsi que des considérations liées à des activités illégales potentielles, un principe de précaution est appliqué. Cela se traduit par une réduction de 30 % du potentiel exploitable dans le domaine forestier permanent et de 50 % dans le domaine forestier non permanent. Il est important de souligner que seules les données d'inventaire validées par le MINFOF (Ministère des Forêts et de la Faune) et conformes au SIGIF 2 (Système Informatique de Gestion des Informations Forestières de 2ème génération) sont considérées comme fiables. Tous les paramètres sont recalculés et ajustés avec rigueur. Un rendement matière de 40 % du quota de récolte est appliqué de manière uniforme pour obtenir le quota de débité.

Enfin, les nouveaux ACNP intègrent des annexes composées de tables de peuplement des stocks de chaque titre ayant permis les calculs des quotas. Les mesures de suivi mises en place sont quantifiables et mesurables, facilitant ainsi une évaluation précise des ressources forestières et des permis délivrés.

II.2 RESTRUCTURATION DE L'AUTORITE SCIENTIFIQUE CITES FLORE POUR RENFORCER LE SUIVI DES ESPECES

Dans le cadre de la mise en œuvre de la politique de gestion durable des forêts par le MINFOF, le suivi des espèces sauvages et le respect des principes de la CITES sont des activités sérieuses et sensibles qui nécessitent une attention particulière.

C'est dans ce cadre que le Ministre des Forêts et de la Faune a procédé à la restructuration de l'autorité scientifique CITES Flore pour le renforcer à travers la décision N° 067/D/MINFOF/CAB du 31 janvier 2023, portant désignation et organisation des Autorités Scientifiques pour la flore dans le cadre de la mise en œuvre de la CITES au Cameroun.

Conformément à cette décision, les institutions ci-après ont été désignées Autorités Scientifiques CITES-Flore du Cameroun :

- l'Agence Nationale d'Appui au Développement Forestier (ANAFOR) ;
- l'Ecole Nationale des Eaux et Forêts Mbalmayo (ENEF) ;
- l'Institut Supérieur d'Agriculture, du Bois, de l'Eau et de l'Environnement (ISABEE) de l'Université de Bertoua.

Les missions dévolues aux Autorités Scientifiques CITES-Flore sont clairement réparties, sauf toutes autres formes de sollicitation spécifique exprimée par l'organe de gestion. En effet, cette décision du Cameroun vise à renforcer la veille scientifique sur le suivi des espèces inscrites aux annexes de la CITES.

II.3 RENFORCEMENT DE LA MAITRISE DES PARAMETRE ECOLOGIQUES, DU SUIVI ET DE LA GETION DES ESPECES

Dans le cadre de l'amélioration des mesures de suivi et de gestion des espèces exploitées, le Cameroun s'engage dans une analyse du statut de conservation de ses espèces ligneuses. L'objectif global de cette démarche est d'évaluer la vulnérabilité des espèces commerciales au Cameroun en se basant sur des indicateurs solides, et de concevoir des plans de gestion adaptés à la diversité des contextes légaux dans le pays, tout en prenant en compte les enjeux associés au commerce international.

De plus, un inventaire forestier national est actuellement en cours de préparation. Celui-ci vise à actualiser le niveau de connaissance du potentiel forestier ainsi que des évolutions des écosystèmes forestiers du Cameroun, dans le but d'orienter de manière plus éclairée les décisions politiques.

III. PROGRES ENREGISTRES DANS LUTTE CONTRE LE COMMERCE ILLEGAL

III.1 LA MISE EN ŒUVRE DU SYSTEME INFORMATIQUE DE GESTION DES INFORMATIONS FORESTIERES DANS LE CADRE DU SYSTEME DE VERIFICATION DE LA LEGALITE

III.1.1 Brève introduction sur le SIGIF 2

III.1.1.1 Contexte de la transition du SIGIF 1 au SIGIF 2

La gestion efficace des informations forestières a toujours été une préoccupation permanente du gouvernement dans le cadre de sa politique de gestion durable des forêts. C'est dans ce cadre que le gouvernement a mis en place une base donnée de première génération : le SIGIF 1.

Du point de vue technique, le SIGIF1 a été développé en 1996-1997 et fonctionnait sur Access 97. Des travaux ont été effectués pour le faire fonctionner sur Access 2003 et différents modules ont été ajoutés tandis que certaines fonctions ont été désactivés. L'un des points faibles du SIGIF 1 était que le logiciel était devenu obsolète car ne pouvant supporter de nouveaux modules nécessaires à un système de traçabilité.

Pour pallier à cette limite, l'introduction d'un système de traçabilité dans le SIGIF 1 nécessitait la révision de la structure de la majorité des tables avec pour effet de devoir reprogrammer la quasi-totalité des formulaires, états et requêtes. Plus encore, l'introduction d'un système de traçabilité devait amener à revoir la plupart des fonctions notamment celles reliées à l'émission des permis.

Dans ce contexte, il semblait évident que pour faire évoluer le SIGIF 1 comme ancrage au système de traçabilité, il devait être plus efficace et moins risqué de programmer une toute nouvelle base de données qui consisterait en fait à un SIGIF de deuxième génération (SIGIF 2). Ce dernier (SIGIF 2) serait ainsi développé avec les technologies plus avancées en matière de gestion de base de données et par conséquent beaucoup plus sécurisées qu'une application Access en impliquant la possibilité d'un ensemble de nouvelles tâches et de procédures adaptées au contexte institutionnel et réglementaire actuel de la gestion forestière, de la fiscalité et des opérations d'exportation

III.1.1.2 Le SIGIF 2

Dans le cadre de l'amélioration de la gouvernance et de la gestion durable des ressources forestières au Cameroun et suite à la signature à Bruxelles en Belgique le 06 octobre 2010, de l'Accord de Partenariat Volontaire entre la République du Cameroun et l'Union Européenne sur l'application des réglementations forestières, la gouvernance et les échanges commerciaux des bois et des produits dérivés vers l'Union Européenne (APV/FLEGT), Accord promulgué par la Loi N° 2011/014 du 15 juillet 2011 et ratifié par le Décret N°2011/238 du 09 Août 2011 du Président de la République, la mise en place d'un « Système de Vérification de la Légalité » (SVL) est une condition sine qua none dans la mise en œuvre dudit Accord.

Le MINFOF a alors entrepris de développer le « Système Informatique de Gestion des Informations Forestières » (SIGIF) de deuxième génération, qui permet non seulement la dématérialisation de la gestion forestière, le suivi de la fiscalité forestière mais aussi de produire toutes les informations nécessaires à la délivrance des autorisations FLEGT dans le cadre du Système de Vérification de la Légalité (SVL).

L'application SIGIF 2 est constitué de dix-huit (18) modules distincts, à savoir : Administration, Données de référence, Codes-barres, Système d'Information Géographique (SIG), Titres forestiers, Inventaires, Permis, Abattages, Opérations de parc, Transformation, Bois CEMAC, Fiscalité forestière, Certificat de légalité, Contentieux, Exportations, Contrôle, Traçabilité et Rapport. Ceci en deux éditions (MINFOF et Opérateur) et sur trois plateformes (Web, Mobile, Desktop).

Le SIGIF 2 a été lancé officiellement le 1er avril 2021.

Figure 2 : Les plateformes du SIGIF 2

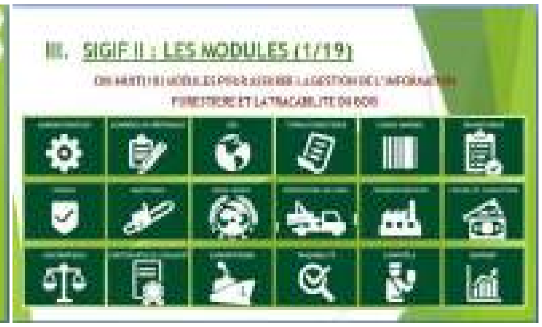

Figure 2 : Les modules du SIGIF 2

III.1.1.3 Le rôle du SIGIF 2 dans la mise en place du Système de Vérification de la légalité (SVL)

Les dix-huit modules du SIGIF2 permettent la mise en application du Système de Vérification de la Légalité (SVL) qui fonctionne sur la base de six (06) éléments :

- La vérification de la légalité de l'entité forestière ;
- Le suivi national de l'activité forestière ;
- Le contrôle national de l'activité forestière ;
- La vérification de la conformité de la chaîne d'approvisionnement ;
- L'émission des autorisations FLEGT ;
- L'audit indépendant.

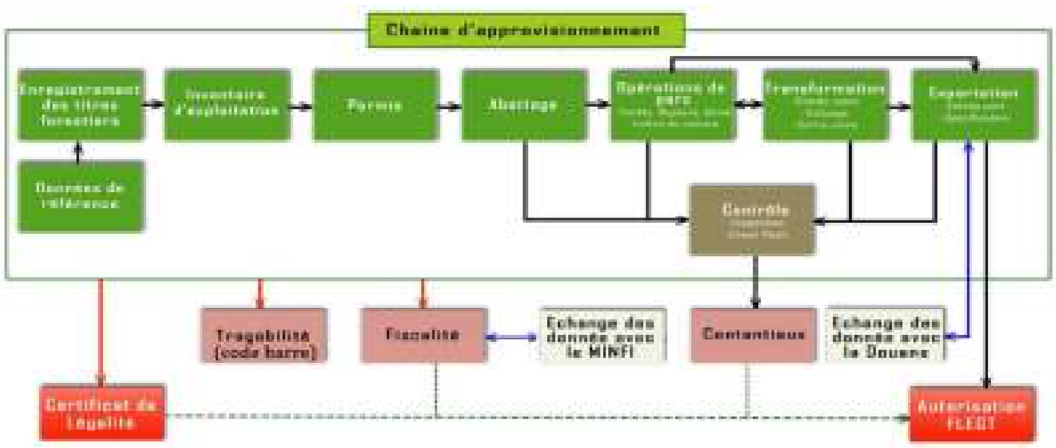

Figure 4 : Schéma fonctionnel du SIGIF 2

1. **Légalité de l'entité forestière** : la base de données du SIGIF 2 contient et recueille toute l'information nécessaire pour identifier un opérateur forestier, une communauté, une commune ou même un particulier exerçant dans le secteur forestier.
2. **Suivi national de l'activité forestière** : le SIGIF2 est l'outil de gestion réglementaire de l'activité forestière dans lequel les opérateurs économiques sont contraints d'enregistrer les

données de leurs activités. En outre, il permet de gérer la fiscalité forestière et donc d'apprécier la conformité fiscale des opérateurs.

3. **Contrôle national de l'activité forestière** : le SIGIF procure au MINFOF de nouvelles possibilités de contrôle forestier en appui aux vérifications sur les axes routiers et sur l'ensemble de la chaîne d'approvisionnement des bois au Cameroun. En aval, il intervient aussi en intégrant un module de gestion du contentieux forestier.
4. **Vérification de la conformité de la chaîne d'approvisionnement** : le SIGIF 2 permet d'assurer une parfaite maîtrise de la traçabilité de tout produit bois jusqu'à la souche de l'arbre d'origine. Sur la base du code à barres qui permet d'identifier de manière unique chaque arbre dans le système à toutes les étapes de la chaîne, on peut remonter toutes les informations du produit bois partant de l'inventaire jusqu'à l'exportation.
5. **Emission des autorisations FLEGT** : le SIGIF2 prévoit par une analyse des signaux relatifs au certificat de légalité, à la situation du contentieux, de la chaîne d'approvisionnement et de la conformité fiscale concernant chaque produit en expédition vers l'union européenne.

Figure 5 : Marquage d'une tige inventoriée au code à barres

Figure 6 : Marquage de la souche d'un arbre abattu au code à barres

Figure 7 : Marquage des colis des bois transformés aux codes à barres

III.1.1.4 Quelques statistiques des données enregistrées et impacts du SIGIF II

III.1.1.4.1 Les statistiques de certaines données enregistrées dans la plateforme SIGIF2

Indicateurs	Quantités / situation	Période
Nombres de structures enregistrées **Total = 1173**	451 opérateurs forestiers 319 communautés 50 communes 8 particuliers 344 entités MINFOF 1 autre (HEVECAM)	01/01/2022 au 09/10/2023
Nombre de comptes utilisateurs MINFOF	346	01/01/2022 au 09/10/2023
Nombre de comptes utilisateurs Opérateurs	2946	01/01/2022 au 09/10/2023
Nombre de Plans Annuel d'Opération (PAO) concessions en convention définitive	80	01/01/2023 au 09/10/2023
Nombre de certificat d'assiette annuelle de coupe (CAAC) concessions en convention définitive	7	01/01/2023 au 09/10/2023
Nombre de PAO forêts communales	38	01/01/2023 au 09/10/2023
Nombre de Certificat de vente de coupe	80	01/01/2023 au 09/10/2023
Nombre de Certificat Annuel d'Exploitation (CAE) Forêts communautaires (convention provisoire et convention définitive) du 1er Janvier au 09/10/2023	75	01/01/2023 au 09/10/2023
Nombre de certificats d'autorisation de récupération de bois du 1er Janvier au 09/10/2023	28	01/01/2023 au 09/10/2023
Nombre de certificat d'enlèvement de bois	25	01/01/2023 au 09/10/2023
Production forestière (m3)	2 658 871, 359 m3	01/01/2023 au 30/09/2023
Estimation des prévisions de la Redevance Forestière Annuelle (en FCFA)	8 990 039 221 FCFA	01/01/2023 au 09/10/2023
Estimation des prévisions de la Taxe d'abattage (FCFA)	10 041 749 830 FCFA	01/01/2023 au 09/10/2023

III.1.1.4.2 Les impacts du SIGIF 2

Le SIGIF 2 étant l'épine dorsale du SVL, il est le levier majeur de la transparence et de la dématérialisation des procédures de gestion forestière en vue de rendre plus efficace l'administration forestière, conformément aux hautes orientations politiques du Gouvernement.

Il s'agit de la base de données réglementaire qui recueille et stock toute l'information documentaire nécessaire pour vérifier la légalité des entités forestières et permettre l'émission des certificats de légalité. Les activités d'exploitation sont enregistrées même en différé et l'application permet de générer en temps réel les statistiques forestières et de gérer la fiscalité forestière, d'apprécier la conformité fiscale des opérateurs économiques de la filière, et de fixer en temps réel l'assiette de recouvrement de la taxe d'abattage. Plus encore, cet outil facilite les vérifications sur les axes routiers et sur l'ensemble des sites de la chaine d'approvisionnement des bois au Cameroun. Ce qui confirme une parfaite maîtrise de la traçabilité de tout produit bois jusqu'à la souche de l'arbre d'origine.

Il s'agit probablement là, de l'une des plus grandes avancées de ces 25 dernières années dans le sous-secteur forestier camerounais, qui suscite d'ailleurs la convoitise des Pays de la sous-région et tient désormais lieu de modèle.

Cette avancée propulse également le Cameroun au rang des nations avant-gardistes, réhausse sa diplomatie et renforce l'image de marque du Pays.

Il en est de même du niveau de conscience climatique et écologique du Cameroun qui a conduit à la ratification par le Chef de l'Etat, de l'Accord de Paris de 2015 sur le Climat qui engage le sous-secteur forestier dans des actions en faveur de l'adaptation et de l'atténuation dans le cadre de la lutte contre le changement climatique.

Pour le Ministère des Forêts et de la Faune	Pour les Opérateurs Forestiers
➢ Célérité dans le traitement des documents ➢ Lutte contre l'exploitation illégale du bois ➢ Maîtrise de la production nationale de bois et des exportations ➢ Maîtrise de l'assiette fiscale et optimisation des recettes ➢ Maîtrise des répartitions de la gestion des revenus issus de l'activité forestière et alloués à l'Etat, aux administrations, aux collectivités territoriales décentralisées et aux communautés ➢ Suivi de la traçabilité des produits bois ➢ Augmentation de la transparence et lutte efficace contre la corruption ➢ Suivi du contrôle forestier routier, portuaire, frontalier et par les structures habiletés	➢ Dématérialisation des procédures d'obtention des documents ➢ Rapidité d'obtention des documents ➢ Maitrise de la production de la société ➢ Mise à disposition des documents signés et scannés dans le système et les opérateurs les télécharges dans leurs bureaux ; ➢ Emission des lettres de voitures par le système ➢ Traçabilité et suivi des exploitations à travers l'utilisation des codes-barres ➢ Facilité de suivi de la chaîne d'approvisionnement

III.1.2 PERSPECTIVES EN LIEN AVEC LA FINALISATION DU SYSTEME DE VERIFICATION DE LA LEGALITE ET LE SUIVI DU COMMERCE DES ESPECES DE FLORE INSCRITES EN ANNEXE II : ENCADREMENT DE LA MISE EN UTILISATION DU SIGIF 2 ET FINALISATION DU SVL

La mise en utilisation du SIGIF 2 est la plus importante démonstration de la prise en main et de l'internalisation par le MINFOF des piliers de la bonne gouvernance promus dans le cadre de l'APV-FLEGT signé entre le Cameroun et l'Union européenne.

C'est le processus au centre du renforcement du Système National de Gouvernance Forestière, adossé au cadre légal et règlementaire en vigueur et construit sur les principes du processus APV-FLEGT.

Dans le cadre de la mise en utilisation du SIGIF 2 il est question pour le MINFOF de finaliser les actions ci-après qui sont en cours :

- La finalisation des référentiels ;
- L'encadrement de l'administration et la gouvernance du SIGIF 2 et les responsabilités ;
- La sécurisation du Système ;
- La formalisation des protocoles de traitement des dossiers dans le cadre du SIGIF 2 ;
- La structuration du Projet SIGIF 2 – Cameroun ;
- La finalisation des grilles de légalités révisées et du Système de Vérification de la Légalité ;
- L'élaboration d'une nouvelle Stratégie nationale de contrôle forestier ;
- L'évaluation conjointe de l'APV-FLEGT et du SVL ;
- Participation au « Broader Market Recognition Coalition » ;

1. **Les référentiels,** l'élaboration des Manuels de procédures est en cours. Une fois validés et rendus exécutoires, le manuel des procédures est appelé à compléter le corpus juridique en vigueur, notamment, les dispositions de l'Arrêté N°0135/MINFOF/CAB du 22 octobre 2020 portant création, organisation et fonctionnement des Postes de Contrôle/Check points Forestiers – « Traçabilité – MINFOF » pour le suivi et contrôle des bois et produits dérivés en circulation sur le territoire national, dans le cadre de l'APV/FLEGT.
2. **Le « Projet SIGIF 2 »,** il convient de rappeler que le SIGIF 2 est un outil de travail à la disposition du MINFOF, qui n'a pas vocation à changer le cadre organique du Ministère, encore moins les

attributions des responsables. Dans ce contexte, le MINFOF envisage mettre sur pied, de nouveaux mécanismes visant à impulser la réadaptation des pratiques au sein du Ministère des Forêts et de la Faune aux plans structurel, organisationnel et fonctionnel, susceptibles d'entretenir un nouvel état d'esprit en adéquation avec les mutations qu'imposent la dématérialisation de l'ensemble des procédures de gestion forestière. Le « Projet SIGIF 2 » vise à accompagner la mise en usage et la gouvernance du SIGIF 2 dans toutes ses composantes en vue de l'optimisation de la performance de la gestion durable des forêts et de la lutte contre l'exploitation forestière illégale.

3. **La finalisation des grilles de légalité révisées,** la finalité recherchée est l'opérationnalisation complète du Système National de Vérification de la Légalité (SVL). En effet, l'enjeu est d'avoir un référentiel national unique qui atteste de la légalité des bois, associé à la vérification de la chaine d'approvisionnement via le SIGIF II, tel que prévu par l'APV-FLEGT.
4. **La stratégie nationale de contrôle,** le MINFOF entreprend de procéder à la révision complète de cette dernière qui est devenue obsolète au regard des procédures de gestion forestière qui ont été complètement dématérialisées.

Dans le cadre de la mise en œuvre de l'APV-FLEGT, le Gouvernement du Cameroun et l'Union européenne se sont accordés pour réaliser une évaluation conjointe de l'Accord et de son système de vérification de la légalité.

III.2 DISPOSITIF EN PLACE POUR LE SUIVI DU COMMERCE DES ESPECES EN ANNEXE 2, CONTRAINTES ET PERSPECTIVES

III.2.1 Mise en place d'un dispositif de coordination de la mise en œuvre de la CITES au sein de l'organe de gestion

Dans le cadre du renforcement du dispositif en place pour le suivi de la mise en œuvre de la CITES par l'organe de gestion le MINFOF a procédé à la mise en place d'une plateforme de concertation sous la coordination du Secrétaire Général. Elle est composée de tous les responsables que j'ai désignés par décision N°0068/D/MINFOF/CAB du 31 janvier 2023 au sein de l'organe de gestion, des représentants des Autorités Scientifiques, ainsi que de quelques collaborateurs en charge du suivi des dossiers relatifs à gestion des espèces CITES. Cette plateforme est chargée :

- d'assurer une veille technique et stratégique dans le cadre du suivi de la mise en œuvre de cette Convention ;
- de veiller à ce que le MINFOF réponde de façon appropriée à toutes les sollicitations des autres Etats, partenaires et le Secrétariat de la CITES ;
- d'examiner et faire des propositions en vue de l'internalisation des propositions des autorités scientifiques ;
- de suivre et évaluer le niveau de mise en œuvre des recommandations des rencontres internationales et toutes autres Directives du MINFOF.

III.2.2 Procédures appliquées pour la délivrance des Permis CITES

Le processus de délivrance des permis CITES est enclenché lorsque l'opérateur économique souhaite exporter le bois qu'il a acquis conformément aux différents types de titres d'exploitation forestière en vigueur. Dans cette démarche, le demandeur soumet une requête précisant les quantités sollicitées et la destination de son exportation. Pour que cette demande soit acceptée, le requérant doit fournir des preuves attestant que les produits ligneux destinés à l'exportation ont été prélevés de manière durable et en conformité avec la réglementation nationale en vigueur. Cela implique la présentation des documents requis, ainsi que des éléments de traçabilité du bois, tels que les lettres de voiture délivrées pour le transport du bois depuis le lieu d'exploitation, dûment approuvées par les services locaux compétents du Ministère des Forêts. Ces documents revêtent une importance capitale pour la vérification légale de l'origine du bois CITES au Cameroun.

La seconde étape consiste à vérifier la disponibilité des quotas d'exportation établis pour le titre d'exploitation en question, tels qu'énoncés dans l'ACNP valide élaboré par l'Autorité scientifique. La

Direction des Forêts tient une base de données de suivi de l'apurement des quotas d'exportation pour assurer cette vérification.

Enfin, les vérifications portent sur d'autres aspects de la régularité de l'entité forestière et de l'exportateur concerné, y compris la confirmation du paiement des frais exigibles. Pour mieux visualiser le processus dans son ensemble, le tableau de synthèse ci-dessous récapitule les différentes étapes du processus de délivrance des permis CITES.

Tableau 1 : Procédure de délivrance des permis CITES pour exportation (**NB** : le processus de digitalisation de délivrance des Permis CITES est en cours)

Etape	Vérificateurs	Observations
Demande timbrée du requérant précisant les quantités sollicitées et la destination	_	_
Vérification de la légalité et de la traçabilité des cargaisons prêtes à l'exportation, concernées par le Permis CITES sollicité	* Source d'approvisionnement (PAO, CAE, CVEPB…) * Lettres de voiture SIGIF 2 ayant servis au transport des spécimens concernés	Source en propre ou en partenariat
Vérification de la disponibilité des quotas d'exportation établis dans l'ACNP valide élaboré par l'Autorité scientifique	*ACNP publié ; *Base de donnée de suivi de l'apurement des quotas	
Vérification des autres preuves de la régularité de l'entité forestière concernée	*Attestation de Non Redevance valide (ANR); *Absence d'un contentieux bloquant en cours (Sommier des infractions); * Enregistrement en qualité d'Exportateur des bois débités (CEQEBD) valide	
Règlement des frais exigés pour la délivrance du permis CITES conformément à la loi des Finances en vigueur	*Quittance de paiement des frais exigés	
Délivrance du permis CITES export et du Certificat d'origine adossé par l'Organe de Gestion	* Permis CITES signé * Certificat d'Origine signé	

III.2.3 Contraintes, défis et perspectives en lien avec le commerce illégal

Contraintes	Mesures de mitigations	Recommandations
Faible maitrise des procédures de la CITES par certains exportateurs	- Renforcement continu de la sensibilisation et renforcement des capacités	Encourager le Secrétariat de la CITES à maintenir son soutien au Cameroun pour sensibiliser les acteurs et améliorer sa gouvernance forestière en mettant pleinement en œuvre tous les modules du SIGIF 2, y compris celui chargé de la gestion des exportations de bois.
Fraude sur certains documents par certains exportateurs	-Renforcement de la gouvernance forestière (**stratégie de contrôle, traçabilité / implémentation du SIGIF 2**) et renforcement de la collaboration avec la Douane, MINJUSTICE, MINCOMMERCE	
Les exigences de certains Etats Partis de la convention, contraires ou incohérentes avec la réglementation nationale : Rejets des Permis CITES exports signés par l'autorité politique compétente **Exemple :** cas de l'Union Européenne qui remet en cause les principes d'aménagement forestier adoptés par le Cameroun en exigeant	-Implémentation de la mesure pour l'actualisation des ACNP 2023 met en exergue l'impertinence de la mesure qui n'apporte pas un impact significatif, mais plutôt augmente les contraintes et s'avère difficilement opérationnalisable	- Rappeler aux Etats Partis le principe du respect des lois et règlements des pays ; - Entamer une concertation avec les Etats Partis concernés pour s'assurer que les règles de la CITES y

par exemple le calcul du taux de reconstitution à l'échelle de l'Assiette Annuelle de Coupe, imposant de ce fait de nouveaux diamètres d'exploitabilité en dehors de ceux fixés par l'Administration et ceux approuvés lors de l'aménagement (Plan d'aménagement)	- Elaboration en programmation des plans de gestion des espèces inscrites en annexe II de la CITES	afférentes ne sont pas violées ; - Recommander le principe de non-ingérence et de confiance mutuelle entre les Etats Patis ; - Soutenir les mécanismes de reconnaissance par les marchés des systèmes nationaux ; - Accompagner l'élaboration des plans de gestion spécifique des essences inscrites en annexe II de la CITES
Incompréhension par les Pays importateurs de certains principes d'aménagements fixés par le cadre légal national qui entraine **des lenteurs dans la délivrance des Permis d'Importation avec des incidences financières sur les opérations** ; Certaines requêtes vont jusqu'à la remise en cause des plans d'aménagement validés	- Renforcement de la collaboration avec les autorités CITES des Pays concernés ; - Renforcement des mesures de gestion des essences CITES en les extirpant des plans d'aménagement pour élaborer leur plan de gestion (mécanisme en cours)	

RÉPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTERE DE L'ENSEIGNEMENT SUPERIEUR

UNIVERSITÉ DE BERTOUA

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RESOURCES AND ENVIRONMENT OF BELABO

Review of the Significant Trade on *Guibourthia tessmannii* (Pinck Bubinga) in Cameroon

Report prepared for the Cameroon CITES Management Authority,

By

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November 2023

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1. Introduction

Cameroon hosts four species of the genus *Guibourtia* (Fabaceae / Leguminosae-Detarioideae) including: *Guibourtia demeusei* (Harms) J. Léonard, *Guibourtia ehie* (A. Chev.) J. Léonard *Guibourtia pellegriniana* J.Léonard and *Guibourtia tessmannii* (Harms) J.Léonard. Bubinga is the pilot or trade name of three species: red Bubinga (*G. demeusei*), pink Bubinga (*G. pellegriniana* and *G. tessmannii*). Rising concerns about over-utilization of this timber species has been reported from Cameroun and neighbouring countries. Internationally traded Bubinga valuable hardwood species have been imported in large quantities to Europe and Asia during the last decade.

From September 24 to October 5, 2016, the seventheen conference of the parties number (CoP 17) of the Convention on International Trade in Endangered Species (CITES) held in Johannesburg, South Africa. Among the decisions, the Bubinga tree species found in Cameroon were listed in the CITES appendix II. These included *Guibourtia demeusei*, *Guibourtia tessmannii,* and *Guibourtia pellegriniana.*

This document reports the current situation of Pink Bubinga tree species in Cameroon in terms of biological data, occurency and population areas, populations trends, population density and structure, trade, recovery rate, management measures as useful elements for the Review of Significant Trade (RST).

Data presented are based on literature revue, internet research, field visits and discussions with different stakeholders. The data were gathered from the literature consisting mainly of the documents of the management plans of forest management units (UFAs) and communal forests (FCs), community forest management plans (FoCs), reports of the Cameroon Forest Management Database (SIGIF), Reports of the Forest Products Export Database (COMCAM), Reports of the National Control Brigade, Reports of the Regional Central Control Brigades of the Central Regions, Littoral and South, discussions and field observations (Betti 2017).

2. Identification

The trade name Bubinga is applied to three different species of the genus *Guibourtia*: G. demeusei (red Bubinga), *G. pellegriniana* and *G. tessmanii* (both pink Bubinga). The taxonomy of Bubinga tree species is as follow: PLANTAE – TRACHEOPHYTA – MAGNOLIOPSIDA – FABALES – FABACEAE / LEGUMINOSAE – *Guibourtia* – *demeusei* (red Bubinga) / *pellegriniana* (pink Bubinga) / *tessmannii* (pink Bubinga).

Due to the similarity of their morphology, local names do not distinguish between trees of the species *Guibourtia tessmannii* and *Guibourtia pellegriniana*. In Cameroon the distribution of Bubinga tree species is largely restricted to the South and littoral regions, with some stands in the Centre and East regions

Guibourtia tessmannii and *Guibourtia pellegriniana* are morphologically close, but differ in the structure of their bark and the anatomy of the wood. These differences are so subtle that distinguishing between the two species is quite difficult for workers in the field.

Guibourtia tessmannii grows on compact soil. It is found in the evergreen atlantic forest in Cameroon Individuals grow on firm, well drained ground in lowland to hilly littoral forests. *Guibourtia pellegreniana* is restricted to dense, littoral forests. It grows on well drained soils and is light demanding.

16 polymorphic microsatellite markers were developed in *G.tessmannii* that amplified to varying degrees in nine congeneric species. These microsatellite markers will be useful for accurate identification of the wood and also to trace the geographic origin of the wood. Phenology and dispersal data are poorly known, otherwise not known

3. Distribution area

Population data are discussed in this document in terms of occurrence, occupancy and density. Data used are from the management inventories, extracted from the document of management plans from Forest management units (FMUs), Communal or council forests (CFs) and community forests (CoFs). Those inventories are often realized at the sampling rates of 0.3 – 1% in FMUs and CFs, and at least 2% in CoFs (Betti 2017). Tables 10 and 11 present in annex, the distribution of Red and Pink Bubinga tree stems respectively in different diameter classes in FMUs and CFs.

3.1.Occurrence map of Bubinga species

Occurrence maps of Bubinga tree species were dressed based on data in terms of presence/absence found in the literature including Vivien and Faure (1985, 2011) and management plans.

G. pellegriniana and *G. tessmannii* have the similar geographic area in Cameroon. They are found in the Littoral and South regions of Cameroon (Figure 1). But *G. pellegreniana* is quite scarce (Vivien and Faure 2011).

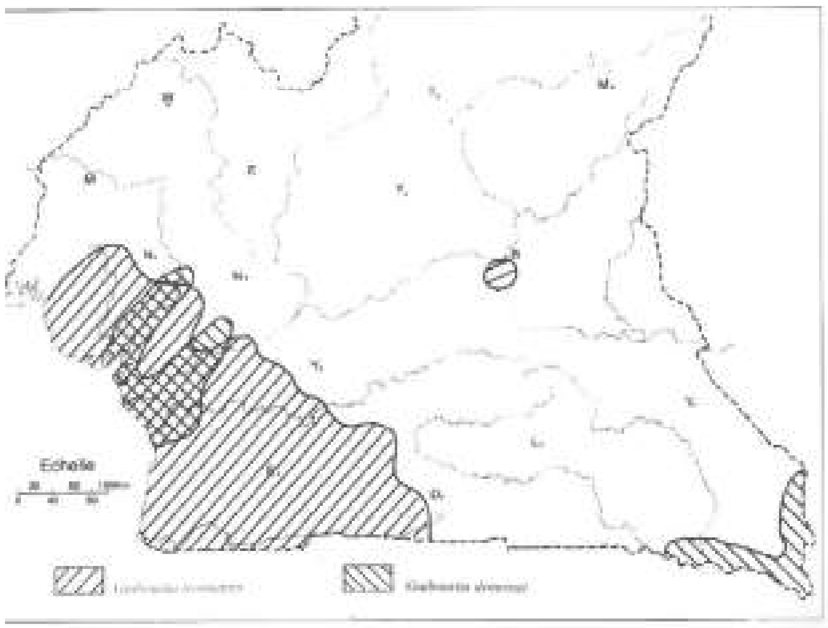

Figure 1. Distribution map of *Guibourtia demeusei* and *G. tessmannii/G. pellegriniana* in Cameroon (Source: Vivien and Faure 1985, 2011)

Figure 2 illustrates the occurrence of the pinck Bubinga in Cameroon based on data recorded in different documents of management plans.

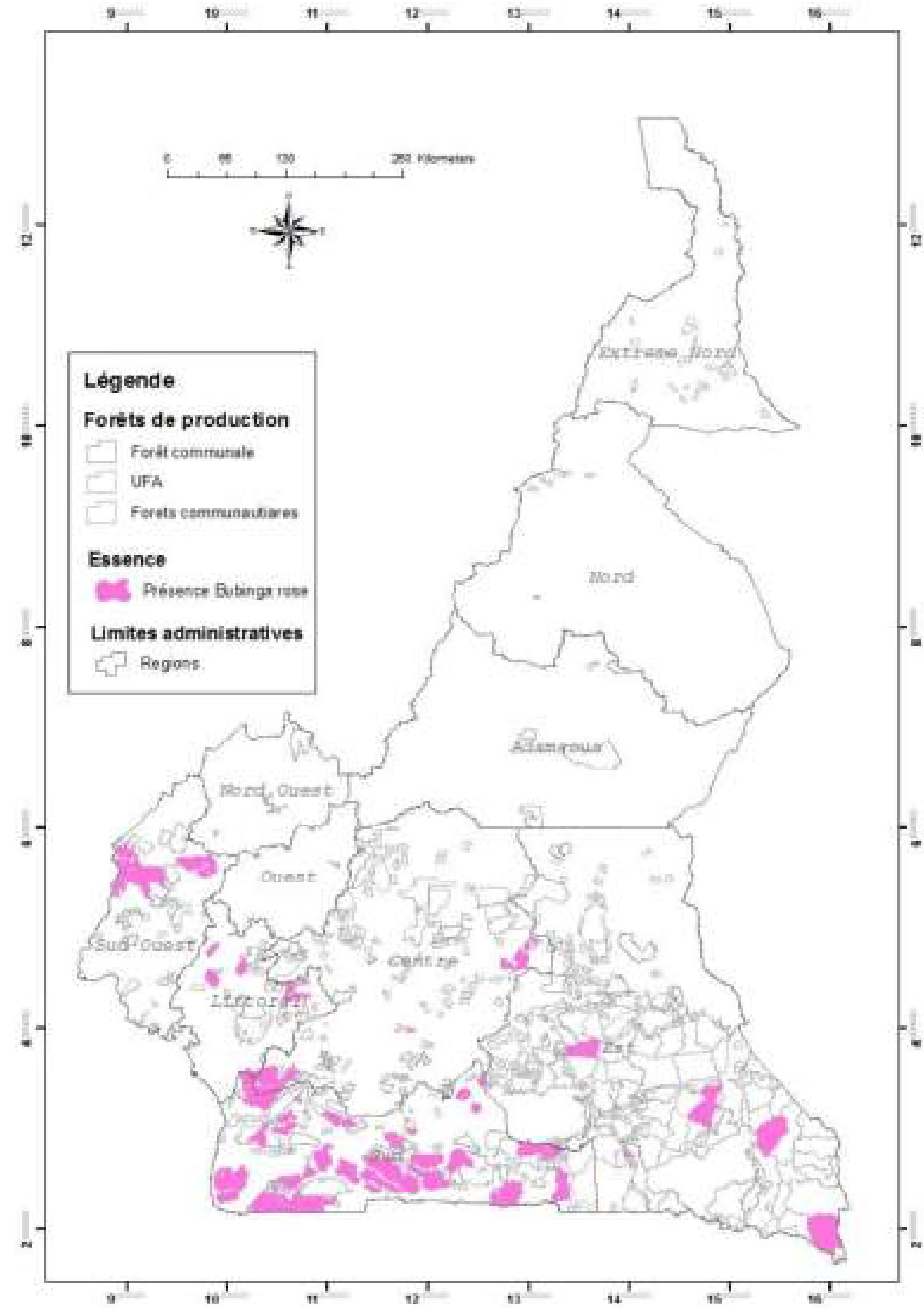

Figure 2. Distribution map of pink Bubinga in production forests in Cameroon (Source © Betti 2017)

We can note that, there are similarities in the occurrence maps of Bubinga species between Vivien and Faure (Figure 1) and data contained in the documents of management plans (Figure 2). For example, the two groups of data reveal the presence of *G. tessmannii* in the Centre, Littoral, South and South-west regions of Cameroon. There are also dissimilarities in the maps drawn from the two sources of data. Hence, Vivien and Faure (opcit.) limits the presence of *G. tessmannii* in the Centre, Littoral, South and South-west regions, while data from management plans extend that map in the East region.

Following what precedes, we conclude that it is difficult to say if the occurrence areas of Bubinga tree species are increasing or decreasing. Further investigations including data from sales of standing volume should aim to see if this is a problem of identification (confusion between *Guibourtia* species for example) or illustrates the modification of the occurrence areas of these tree species.

3.2.Densities and occupancy maps

The national forest resources assessment conducted by FAO from 2003 to 2004 gives the density of 0.00 stem/ha for *G. demeusei*. Nothing is said for what about other *Guibourtia* tree species (MINEF - FAO 2005). According to the Pilot Integrated Management project (API project) which has been working in the East province of Cameroon for a long time, a plant species is said to be less represented for logging when its average density is less than 0.05 stem/ha (Forni 1997).

Table 1 presents for each forest concession, the sampling rate and the density (number of stems/ha) of pinck Bubinga. The inventories were conducted between 2003 and 2008. The average sampling rate is 0.8 %, which is very good. The average density of pink Bubinga for diameter ≥ 20 cm is 0.02 stems/ha, which is low than the 0.05 stems/ha considered as the minimum limit.

Table 1: Distribution of pink Bubinga (*G. tessmannii*) density in different council forests and Forest Management Units in Cameroon in the permanent domain, data extracted from the management plans (Source Betti 2017).

Order number	Forest Concession	Total area (ha)	Sampling area (ha)	Sampling rate	Total stems	Density
1	CF of Mintom	41455	414.55	1.0	191	0.005
2	CF of Akom II-Efoulam	17226	189.49	1.1	128	0.007
3	CF of de Messondo	16864	180.5	1.1	368	0.022
4	CF of Minta	41087	513.59	1.3	165	0.004
5	CF of Mvangan	33720.5	336.5	1.0	1045	0.031
6	CF of Nyanom Ngambet et Ndom	46875	382	0.8	1102	0.024
7	CF of Yokadouma	22206	222.1	1.0	109	0.005
8	CF of Bengbis	27800	278	1.0	6147	0.221

Order number	Forest Concession	Total area (ha)	Sampling area (ha)	Sampling rate	Total stems	Density
9	CF of Bipindi et AkomII	23204	232	1.0	199	0.009
10	CF of Ambam	45895	442	1.0	1233	0.027
11	CF of Ngoulmekong et Mengong	10338	164.16	1.6	59	0.006
12	CF of Biwong-Bane	88410.2	254.5	0.3	589	0.007
13	Concession №1001. FMU 09-006	74432	469	0.6	184	0.002
14	Concession №1293. FMU 09004a. 09005a. 09005b	183350	916.75	0.5	6889	0.038
15	Concession №1050. FMU 09017. 09018	99459	775.8	0.8	1191	0.012
16	Concession №1069. FMU 09020	43905	583	1.3	79	0.002
17	Concession №1006. FMU 09021	36439.8	415	1.1	816	0.022
18	Concession №1036. FMU 09019	38247	469.5	1.2	388	0.010
19	Concession №1033. FMU 09004b	65675	458.5	0.7	333	0.005
20	Concession №1064. FMU 09016	54822	548	1.0	2069	0.038
21	Concession № 1006. 1037 et 1011 FMU 09-021. 09-024 et 09-025	198361	1770.43	0.9	3329	0.017
22	Concession № 1011. FMU 09025	88147	881.5	1.0	102	0.001
23	Concession № . FMU 10005A. 10005B	89322	878.5	1.0	160	0.002
24	Concession № 1063. FMU 090013	42402	424	1.0	4782	0.113
25	Concession № 1068. FMU 110021A. 110021B	54529.57	416.91	0.8	278	0.005
26	Concession № 1028 . FMU 00003	102699	503.4	0.5	1678	0.016
27	Concession № 1091. FMU 070023	38195	382.19	1.0	1180	0.031
28	Concession № 1063. FMU 09013	51318	586	1.1	318	0.006
29	Concession № 1035. FMU 09015	41559	415.19	1.0	731	0.018
30	Concession № 1064. FMU 09016	64646.32	426.5	0.7	299	0.005
31	Concession № 1005. FMU 09023	51050	484.5	0.9	272	0.005
32	Concession № 1037. FMU 09024	74625.8	461.32	0.6	4778	0.064
33	Concession № 1081. FMU 09 026 et 09027	18267.04	219	1.2	405	0.022
34	Concession № 1007. FMU 10028	62389	623.5	1.0	92	0.001
35	Concession N° 1045. FMU 10 049 et 10 050	70688		0.0	4694	0.066
36	Concession № 1087. FMU 11005	70298	790.5	1.1	300	0.004
37	Concession № 1068. FMU 11 002	72705	366	0.5	441	0.006
38	Concession № 1060. FMU 10 064	115900	1125	1.0	348	0.003
39	Concession № 1086. FMU 11 001	94917	474.5	0.5	585	0.006
	Total/mean	**2413429.23**	**19473.88**	**0.8**	**48056**	**0.020**

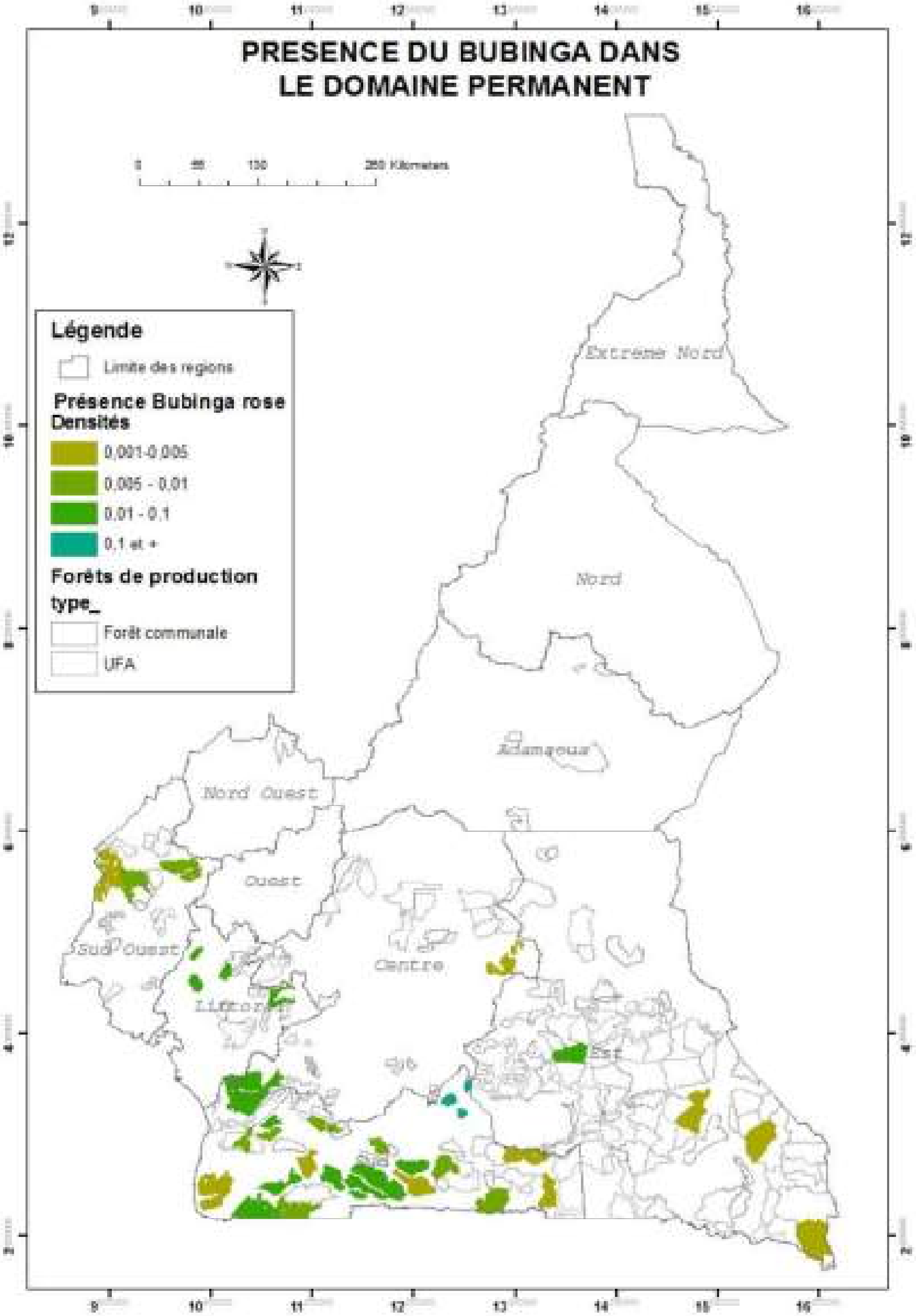

Figure 3. Density (occupancy) map of Pink Bubinga (*Guibourtia tessmannii/pellegreniana*) in Cameroon

4. Population trends

The best way for updating the distribution map or viewing the population trend of a given tree species is to compare data collected with similar methods in two different periods. This is not easy, since the methods used by different authors in forest inventories differ. Trend on Bubinga can be examined in Cameroon through data presented in the document of management plans from Forest management units (FMUs), Communal forests (CFs) and community forests (CoFs).

5. Production

At the end of the year, each logging company has to conduct a logging or systematic inventory in a specific annual plot. This inventory concerns only exploitable stems. The report is then used to apply for a given volume for the next fiscal year. Between 2008 and 2012, the logging volume of Bubinga tree species requested and expressed in different annual certificates increased at least five times (9 123 m^3 in 2008 – 42 428 m^3 in 2012), showing the high pressure on those tree species (Betti et al. 2016). Figure 4 illustrates the evolution per plant species of the logging volume of Bubinga between 2010 and 2016. The red Bubinga is the species which is highly requested and attributed. This is in line with its high densities and volumes found in production forests as shown in section 3.5.4. We can also see that the volume of Bubinga trees, has drastically droped down, being 7 times low in 2013, 11 times low in 2014, and 9 times low in 2015-2016.

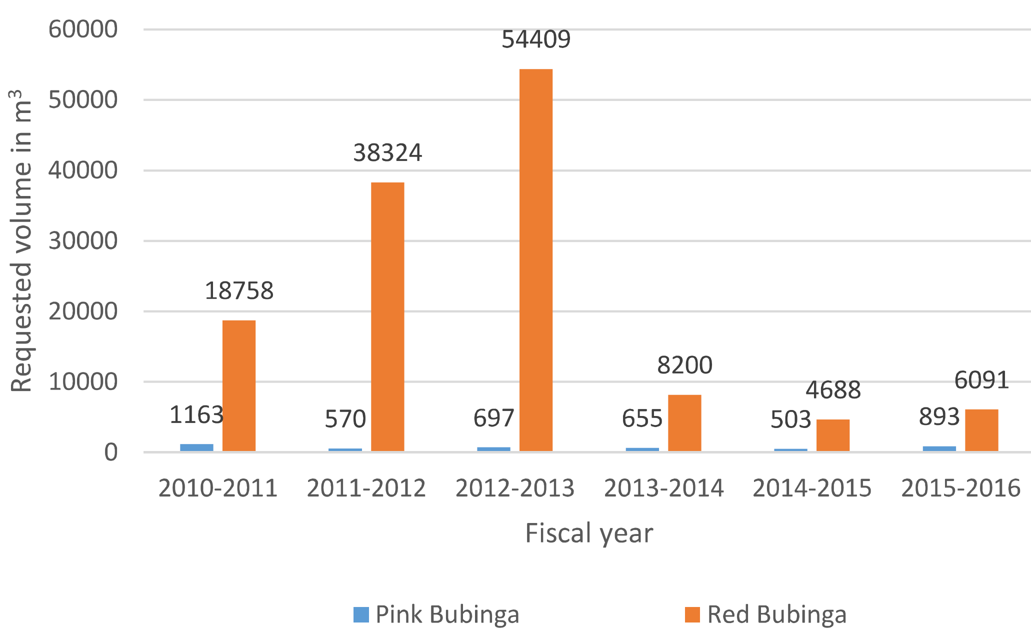

Figure 4. Evolution of logging volume of Bubinga species requested between 2010 and 2016. (Source © Betti 2017)

A total of four forest titles can log Bubinga tree species including: the authorization of collecting timber, the definitive concession (FMUs or CF with validated management plans), the temporary concession (FMUs and CFs in preliminary convention), and the sales of standing volume. Authorization of collecting timber are called small titles. They were introduced through the circular letter N° 0131/LC/MINFOF/SG/DF/SDAF/SN of 20th march 2006 related to the procedures of delivrance and monitoring of small forest titles. Small titles differ from others by their small surface area, they are opportunist and occasional. They are issued to persons who want to use timber that comes from some investments which induce deforestation such as agriculture, salvage logging, dams, establishment of roads, building. Sales of standing volume are forest titles which are issued for logging in forest less of 5 000 ha settled in the non permanent forest domain. They differ from FMUs, CFs, and CoFs by the absence of the management plan. This means that, the holder of a sale of standing volume does not need to develop a management plan for the conservation and sustainable harvesting of the resource. Preliminary convention (forest without validated management plan) and definite convention (forest with validated management plan) as indicated by the database on forest logging (SIGIF) are forest titles that belong to CFs and FMUs. Timber logged in CoFs is not registered in SIGIF.

The distribution of the logging volume of Bubinga in different forest titles and years is illustrated in figure 21. We can see that, from 2010 to 2012, sales of standing volume were the most important forest titles which logged Bubinga in Cameroon. The volume of Bubinga trees logged in sales of standing volume increased 45 times in 2012-2013 compared to 2010-2011. Between 2008 and 2013, the logging volume of Bubinga recorded in sales of standing volume represented at least 50% of the total volume. This practice was considered as detrimental to the survival of the Bubinga trees in Cameroon forests (Betti 2012). Having been aware of this problem, the Government of Cameroon decided to reduce the logging of Bubinga species in non-managed forests, in sales of standing volume and authorization of collecting timber to be precised as illustrated in figure 21. Concrete measures undertaken include the banning of the logging of Bubinga tree species in sales of standing volume from 2014 to date, the banning of delivrance of authorizations for collecting timber since 2015, and the banning of logging Bubinga in FMUs and CFs with very low densities of Bubinga. Since 2015, the logging of Bubinga tree species has been limit to the CFs and FMUs.

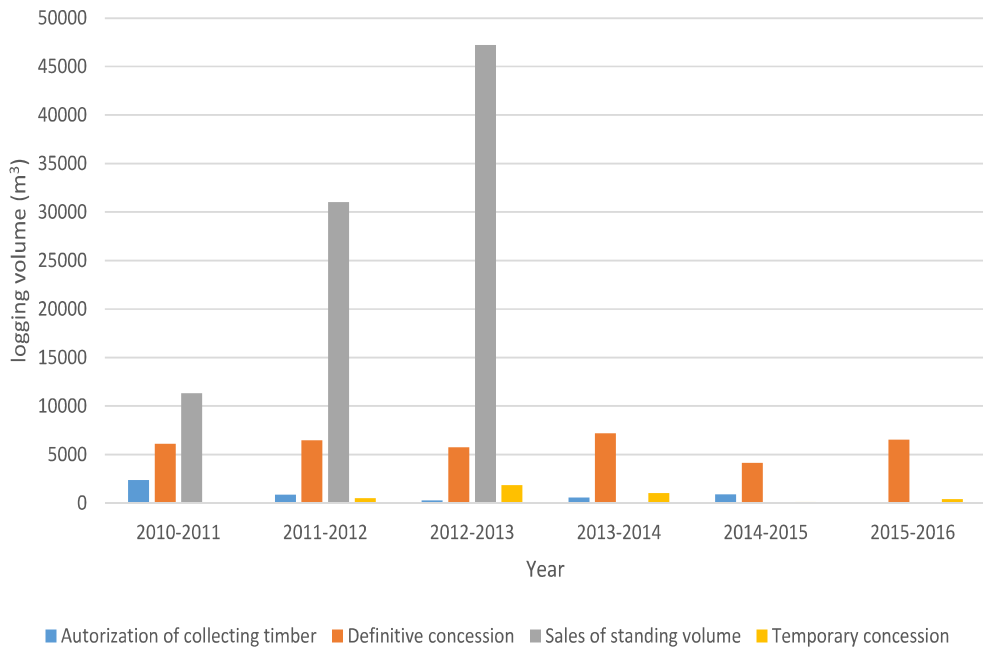

Figure 5. Distribution of logging volume of Bubinga in different forest titles between 2011 and 2016. (Source © **Betti 2017)**

A total of 13 080 m^3 of sawn wood of Bubinga was exported from the Douala port between 2010 and 2016. The Bubinga sawn wood of Cameroon was exported in 22 countries (Figure 6). China is the country which imported the highest volume of sawn wood of Bubinga species from Cameroon, with 6 645 m3, representing 59.2% of the total volume exported in the indicated period. These results are in line with the “Asian phenomenon” explained above.

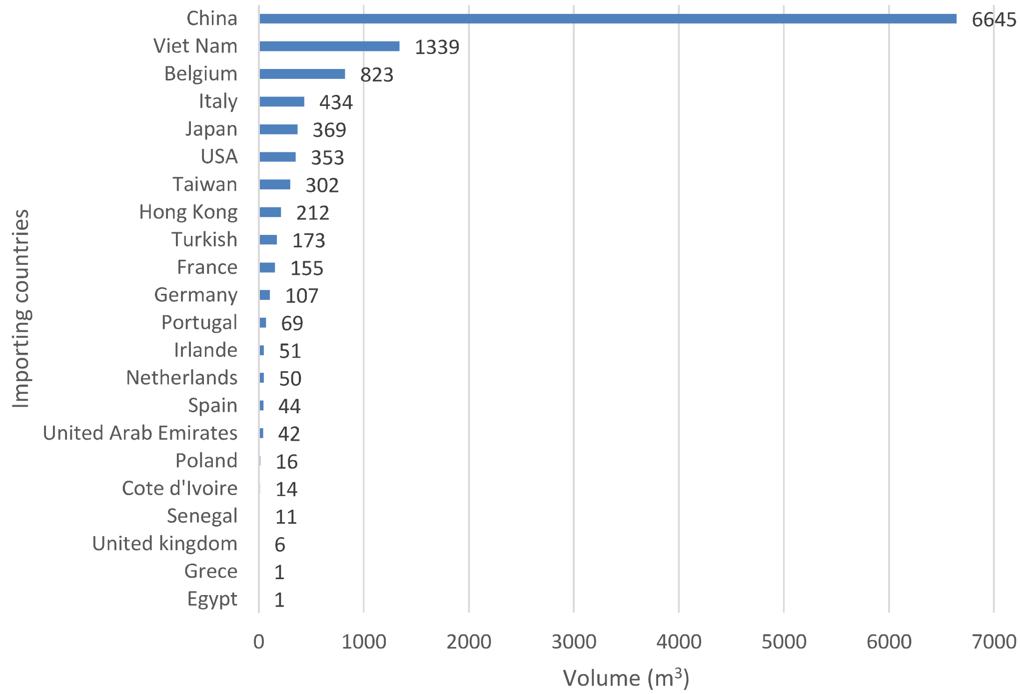

Figure 6. Distribution of exported sawn wood of Bubinha species in different importing countries between 2010 and 2016. (Source © Betti 2017)

Figure 7 illustrates the evolution of export volume in different years. Globally, the export volume decreases. For the pink Bubinga (*G. tessmannii*) it is the sawn wood that is highly exported with 11 217 m^3, representing 86% of the total volume of Bubinga sawn wood exported during that period. The red Bubinga appears only in 2016 with 1 863 m^3.

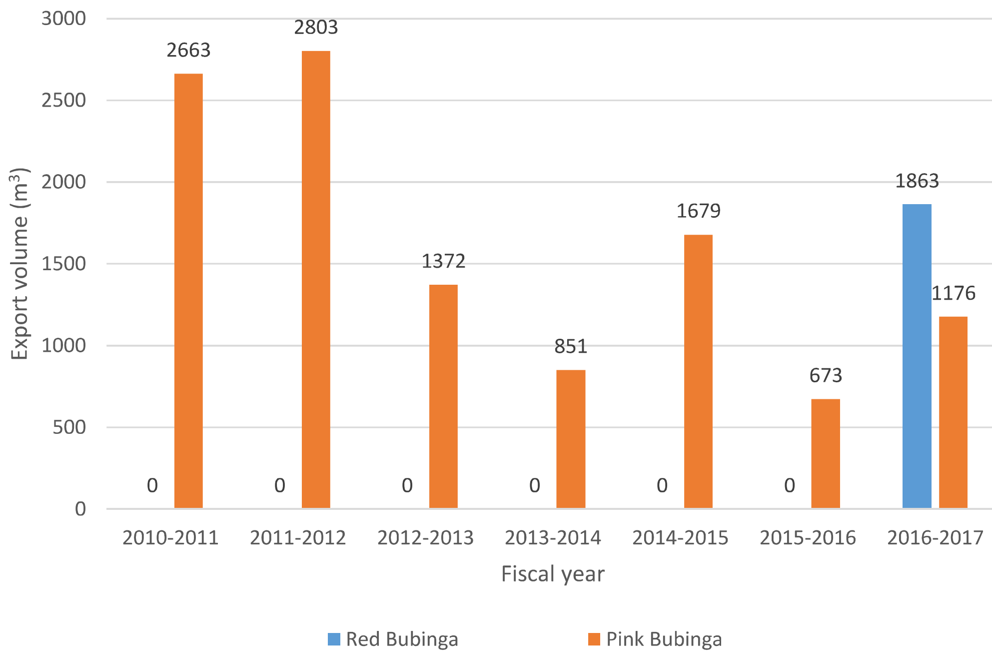

Figure 7. Evolution of export volume of Bubinga species at the Douala port between 2010 and 2016. (Source© Betti 2017).

6. Utilization

Bubinga tree species are highly appreciated by forest exploiters because of their hard, red-coloured wood (photo 1), which is used to make furniture or music instruments in Europe and Asia (**Source**: http://www.foei.org/en/resources/link/95/e95benoit.html). Bubinga is one of the most use wood by Cameroonians for confectioning their furnitures (tables, chairs, beds) and for internal decoration of houses. In Ebolowa (south region) for example, about 90% of the wood used in confectioning beds and furnitures are composed of the Bubinga wood. The main production sites of Bubinga are: the south region, the Centre region, and the littoral region. In Littoral, the high quantity of Bubinga comes from Puma. In the Centre region, productions sites comprise Eséka, Nguibassal. South is the main production area of Bubinga which is found in almost all areas including Mvangane, Mengong, Biwong Boulou, Ngoulemakong, Biwong Bané, Lolordorf, Oveng, and Meyo Messi. The importance of Bubinga market increased in two phases: in 2011, the products were only sawn wood. Since 2012, there are also logs.

Common uses: Boat building (general), Boat building, Boxes and crates, Brush backs & handles, Cabinetmaking, Canoes, Carvings, Chairs, Chests, Concealed parts (Furniture), Decorative veneer, Desks, Dining-room furniture, Domestic flooring, Dowell pins, Dowells, Drawer sides, Figured veneer, Fine furniture, Floor lamps, Flooring, Furniture , Furniture components, Furniture squares or stock, Furniture, Handles, Hatracks, Interior construction, Joinery, Kitchen cabinets, Lifeboats, Living-room suites, Millwork, Mine timbers, Musical instruments, Office furniture, Paneling, Parquet flooring, Plywood, Radio - stereo - TV cabinets, Railroad ties, Rustic furniture, Shafts/Handles, Shipbuilding, Stair rails, Stairworks, Stools, Stringers, Sub-flooring, Tables , Tool handles, Turnery, Utility furniture, Vehicle parts, Veneer: decorative (Source: http://www.thewoodexplorer.com/maindata/we598.html)

7. Management measures in place

7.1. Forest law

Cameroon is considered to be the most advanced of the Congo Basin countries, in terms of forest sector policy in the Congo Basin (Carret, 2000; Karsenty 2006). This means that Cameroon is the first country in the Congo Basin Forest Massif to have produced and implemented a forest code, after the Earth Summit (Rio de Janeiro in 1992). The important point to note is that all the technical and legal architectures in terms of sustainable management of natural tropical forests in Cameroon have been designed:

- A modern forest code establishing a sustainable management system for natural forests has been in force since 1994;
- Technical standards for forest operations are in force, all private concessionaires are required to apply them;
- National guidelines on forest management are available (and Order No. 0222 / A / MINEF of May 25, 2001 put them into force in the forestry sector);
- Cameroon has designed its own principles, criteria and indicators for the sustainable management of natural tropical production forests (as an adaptation of ATO / ITTO / PCI);
- Cameroon has designed a monitoring and evaluation manual for the sustainable management of production forests;
- Cameroon is implementing a forestry sector program, as a tool to finance the activities necessary to support the execution of its forestry policy and its action plan;
- Cameroon has signed numerous agreements with multilateral partners based on good management of its forestry sector (voluntary partnership agreement with the European Union, etc.);

All the legal and technical instruments for the sustainable management of natural production forests are thus available and implemented. The Cameroonian Government, through its forestry administration, intervenes at different stages in order to ensure the conservation of forest resources through : knowledge of the resource (validation of inventories) , zoning of the country and the allocation of different land uses , improvement of forest control , and monitoring of the forest value chain . The general objectives set by the forest policy for forest management in Cameroon are as follows:

- To ensure the protection of the forest heritage and to participate in the protection of the environment and the preservation of biodiversity in a peaceful manner;
- A mproving the public participation in the conservation and management of forest resources;
- M etter value forest resources in order to increase the share of forestry in gross domestic product (GDP), while maintaining the productive potential;
- To ensure the renewal of the resource through regeneration and reforestation in order to sustain the potential ;
- To boost the forest sector by setting up an effective institutional system and by involving all stakeholders in the management of the sector ;

The 1994 Forest Code reform met several objectives: to regulate industrial logging in order to increase State tax revenues, while pursuing conservation objectives, but also to promote decentralization and the participation of communities and local authorities. sustainable management of forest resources.

Article 1 of the 1994 Forest Code establishes the relationship of the law with the objectives of forest policy, wildlife and fisheries, and defined as a fundamental principle "integrated management ensuring sustained and sustainable conservation and the use of said resources and different ecosystems ”. The bringing together of regulations concerning forest resources, fauna and fishery resources in a single text, leads, at least for these areas, to an integrated approach.

During the 1980s, the Cameroonian Government had already decided, with the help of the international community, to deal with the general problem of sustainable forest development. Consequently, the Government initially concentrated its efforts on knowledge of the timber resource of the southern or forest zone of the country.

A national forest inventory was therefore planned in 7 phases. Four (4) of these phases were carried out in the 1980s, for a total forest block of 14,000,000 hectares, at the northern limit located at about 4 ° parallel. In fact, the basic work undertaken in the national inventory carried out during the 1980s (CENADEFOR - CTFT 1983, 1985) led to the development of main standards and technical tools necessary for the management of the forest estate. These tools include: (1) The zoning plan (phases 1-4 of the national inventory) which led to the division of the forest zone into two main types of domains, notably: the Permanent Forest Domain (DFP) and the Forestier Non Permanent (DFnP), and (2) all the standards relating to forest interventions (Production forests).

7.2. Restoration and alleviation measures.

Law No. 94/01 of January 20, 1994 on the regime of forests, wildlife and fisheries indicates in its Article 45 that, the management of production forests (FMUs and community forests) is subject to a management plan approved by the forest administration. The management plan is developed on the basis of a management inventory. Article 41 stipulates that, the management inventory must be conducted according to standards approved by the forest administration.

For the assessment of resources prior to development, the Cameroon Forest Administration has developed standards that must be followed for all inventory, development and pre-investment work (ONADEF, 1991) as well as for exploitation inventories (ONADEF, 1995). In addition, standards for verifying the various inventory work have also been established (ONADEF, 1991) and a guide for tree studies during re-gluing work has been drawn up (ONADEF, 1998).

In 1991, the National Office of Forest Development (ONADEF) edited the document entitled "Standards for forestry asset management and pre-investment", which was approved by the forest administration. These standards describe the methodology used to perform a forest management or pre-investment inventory. This methodology is hereinafter briefly described.

Sampling device/sampling design

According to the standards, the sampling of the management inventory is systematic and stratified to 1 degree when the statistical unit is the plot. The samples (plots) are distributed systematically throughout the entire population and not by stratum (Forest layer). The stratification is done definitively after the sampling. The systematic disposal of plots allows to assume that the intensity of sampling for each stratum is proportional to its area in the forest. Results of the inventory and their accuracy are calculated for each stratum.

In practice, sampling is carried along straight and continuous axes called "layons" or "lines" or "transects". These "layons" are oriented along a predetermined magnetic direction but are systematically arranged in such a way that they are mostly parallel, equidistant and perpendicular to the general direction of drainage.

In principle, each FMU can be divided in several compilation units (CU). A CU is a basic territorial unit for which the compilation and validity of the results are applicable. A CU is an area of the forest which is homogeneous mostly in term of topography: rocks, valleys, mountains. For example, if the FMU contains a mountain, each side of the mountain can be considered as a CU. Each "layon/transect" crosses all the CU from one limit to another. As it is, "layons" have therefore variable lengts, depending of the length of the CU.

Plots arranged along a transect are contiguous (without alley or corridor of separation) and should measure 250 m in the direction of the "layon" (length) and 20 m in the direction perpendicular to the "layon" (width). This gives a surface area of 0.5 ha for each plot.

The formula which allows to calculate the distance or interval between two consecutive transects in a given CU, what ever be its form, is as follows:

$$\text{interval} = \frac{\text{Net Area to probe or to be survey or the useful area (ha)} \times 20 \text{ m}}{\text{Area actually probed (ha) or the sampling area}}$$

Sampling intensity

The sampling intensity is the ratio between the area sampled and the total area of the CU. It must provide for the parameters studied, values which are representative of the general population and this, according to precised criteria set in advance. But this precision of the results obtained with a given sampling intensity depends on the variability of the parameter measured in this population. When fixing in advance the desired precision, one must have some idea of this variability as to calculate the number of samples which will be collected (choosen). The surveys conducted so far in dense forest and using the technique presented here have estimated the number of sample plots required to achieve the required accuracy. This accuracy is 10% probability threshold of 95% for major species, the number of plots selected at the conclusion of this study was 500 sample plots representing 0.5% or 250 ha. Given the surface areas of CU used respectively for management inventory, the proportion actually inventoried ranges from 0.5% to 1%. However, these rates may vary depending on the size of the forest to be inventoried.

Prospection/survey

The survey or prospection consists of two steps: lining and counting.

Lining

Lining consists of two steps which include line opening and line characterization.

Line opening/transect cutting

This step consists of opening or cutting according to a defined magnetic direction, corridors or alleys of 1.5 m wide. These corridors are clearly cleaned by cutting shrubs, vines and branches that obstruct the passage. They are then identified by marks. Transects constitute the reference system which will be used by the subsequent counting team.

Line characterization

This step consists of giving details of the topography, habitat types, rivers and the corrected horizontal distance of the transect (after reading the slope table). It is also during this stage that the sample plots are identified and numbered. The data collected are recorded on a specific file called “lining sheet”.

Counting

The counting step includes all operations relating to the gathering of dendrological (qualitative data) and dendrometric records (quantitative data). All species found in the plots are prone to be inventoried. A list of tropical tree species identified in previous inventories has been published by the forestry administration.

Stems with diameter at breast height (dbh = 1.50 m) below 10 cm are measured only in sub plots of 0.01 ha (10 m x 10 m) located within the first 5 meters of each plot. This inventory aims to appreciate the natural regeneration of the forest. The stems whose DBH ≥ 20 cm are counted and measures on the entire surface of the plot (0.5 ha).

Data processing

Results of management inventory are given by stratum (habitat type), per hectare and for the entire surface area. Mapping is prior to the data processing. This map is done based on aerial photos. As said, data processing is done with the TIAMA package.

Volumes are obtained using the volume tables, established during the corresponding national inventory phase. For the specific case of *Guibourtia*/Bubinga species, the volume table was estimated during the phase IV of the national inventory. That phase proposed a same volume table for the following three Bubinga species including *G. tessmannii, G. demeusei*, and *G. ehie* and which is is $V = a+bD+cD^2$, with V = volume, D = diameter at breast high in cm, and a, b, and c being the parameter (coefficients) of the equation, defined as a = .0.200556, b = 0.008164, c = 0.00064.

The different results often obtained at a species level are: the stand stems table or actual number of trees per hectare, the total number of stems and the table of stock or volume per hectare, and the total volume or possibility (stand volume) of the forest for the indicated tree species.

A few general provisions for the management of Bubinga have been taken by the forest administration. They include the minimum girth limit: 80 cm which is among the highest in the Congo basin, the marking of seed-trees (with a record of GPS coordinates for each of them), adequate spatial distribution and artificial regeneration work undertaken in some production forests (FMUs, CFs, CoFs).

The basis of restoration and alleviation measures related to data processing is outlined in the arête *n° 0222/A/MINEF/ of 25th may 2001,* article 6 (element 5: calculation of the forest possibility) to article 10 as follow.

The possibility is the quantity of wood that can be harvested per hectare after each cutting cycle. The calculation of the annual cutting (logging) possibility or annual logging volume is an iterative process of optimization, aiming to well determine the rotation (periodicity of cutting) and the minimum exploitable diameters for managed trees (this is call the managed minimum exploitable diameter = MED/AME or the minimum managed diameter = MMD). The parameters used in the calculation of the forest possibility and the determination of the MMD include: the choice of the managed trees, the rotation, the growth rate in diameter of trees, the volume table, the damage rate and the mortality rate.

Rotation is the delay between two successive harvests. It is the time spent between two successive logging years in the same space. In Cameroon, it is fixed at 30 years for FMUs and

CFs and 25 years for CoFs. However, this can increase in case of some specific constraints revealed by the analysis of the management inventory data.

The annual growth rates in diameter used are those which are published in the technical files (sheets) by the forestry administration. For Guibourtia/*Bubinga*, the growth rate is 0.45 cm/year.

The minimum exploitable diameter of managed trees MMD proposed by the manager (forest company), may not be less than that one (MED/ADM) fixed by the forest administration, and may not be more than MED + 30 cm.

For the managed species, stems with diameter high than MED/ADM + 40 cm and more, are retrieved from the initial population table which serves to simulate the forest possibility. These stems are called the "bonus".

However, all trees of this group "bonus" are subjected to technologic inventory, aiming to appreciate the quality of the wood, and to allow the selection of mother trees (useful for seedlings production) which will be banned (forbidden) for any exploitation in the concession.

The reconstitution rate (or the recovery rate) of species to manage, the minimum managed diameter (MMD), and the rotation, interact one another towards the determination of the possibility.

The reconstitution rate (in percentage) is calculated using the following formula, developed by the Pilot Integrated Management project (API) which was implemented in Dimako, East region of Cameroon in 1998 (**Durieu de Madron *et al.* 1998**). The reconstitution rate is an index which allows to know if the logged stems will be replaced by other stems situated below of the MMD at the end of the rotation and at which proportion.

$$\mathbf{\%RE = (No\ (1-\Delta)\ (1-\alpha)^T)/Np}$$

Where:

- **No**: number of stems with diameter classes < MMD, which are used for the reconstitution (reestablishment) of the ligneous resource;
- **α**: natural mortality (1%) per year;
- **Δ:** mortality caused by logging damage;
- $^{\mathbf{T}}$: rotation (30 years);
- **Np**: total exploitable stems (MMD + 3) to be reconstituted;
- **%Re**: reconstitution rate (in %).
- The Annual growth rate (AGR) for the two Bubinga is 0.45 cm/year.

The reconstitution is good when %Re is more than 50%. The principle of the simulation consists of increasing progressively the administrative minimum exploitable diameter

(MED/ADM) as to get a %Re ≥ 50%. Sometimes, the reconstitution can only be possible after decreasing the number of exploitable stems (Np). The new minimum exploitable diameter which provides the best simulation (%Re ≥ 50%.) is called the minimum managed diameter (MMD). Some experts think that the TIAMA package should be evaluated and revised, due to the great variability of Cameroon forests (ITTO 2009).

The forest delimitation is done on a map at 1/50 000 based on the results of the management inventory. It is realised in two steps:

- **Step 1**. Firstly, the forest concession is divided into five-years blocs **of equitable exploitable volume**, as to obtain a difference of less than 5% of the exploitable volume for the principal tree species (managed and complementary);
- **Step 2.** Secondly, the five-year blocs are themselves divided as to allow a continuous progression of logging activities in the space and time. Each five-year bloc is divided in **5 logging units (annual plots)**, contiguous and with **equitable surface areas**.

Sylvicultural treatments, rather than cutting in respect with the MMD, must be conducted as to ensure the forest reconstitution (reestablishment) at the end of each rotation.

The nature, objectives, intensity, and the planning of sylvicultural operations are described in the documents of the management plan, and of the five-year management plan. The annual operation plans precise for the indicated year, the areas managed, the forest strata logged, and the planning of future interventions.

Research activities useful to complete the based data, which are necessary to ensure sustainable management are précise in the management plan.

Many plots can be opened to forest logging simultaneously, but they must be contiguous. A five-year management unit is definitively closed to forest logging, 6 years after its opening by the forest administration.

Article 35 of the arrêté 0222/A/MINEF indicates that the management plan is obligatory revised every 15 years or at the end of the rotation.

8. Population structure, managed diameter, recovery rate

8.1. Population structure

The description of the population structure is limited to the Comunal forests (CFs) and forest management units (FMU), subjected to Bubinga logging for exportation. The specific curve of *G. tessmannii* is illustrated in figure 8. This tree species seems to have a good regeneration in FMUs and CFs.

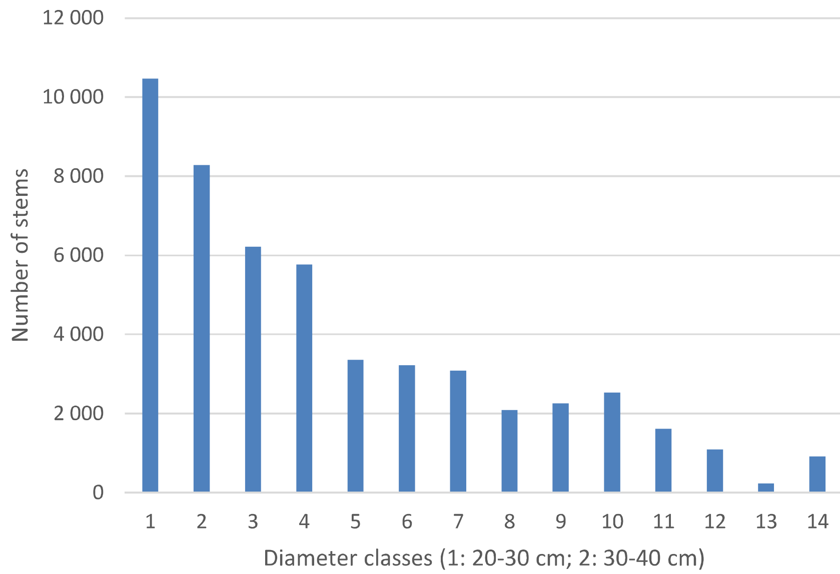

Figure 8. Stand structure of *G. tessmannii* in production forests in Cameroon (Source © Betti 2017)

8.2. Determination of the management diameter (MED/AME) and recovery rate for Bubinga tree Species (Betti 2017)

The minimum management diameter (MMD) was deduced based on the reconstitution rate obtained at Np 100% or Np 80%, with Np being the number of exploitable stems at MED+3. Table … presents densities, reconstitution rates at Np 100% and Np 80% respectively for the pinck Bubinga. The average minimum managed diameter (MMD) is is 110 cm, for an harvesting rate of 80%. The total number of exploitable stems is 6 175. A total of thirteen forests will be excluded from any logging activity of Pink Bubinga (Table 2).

Table 2. Densities, reconstitution rate and Minimum managed diameter of Pink Bubinga in Communal forests and Forest management units in Cameroon (Source © Betti 2017).

Titre Concession	Surface area	Total number of stems	Density	Np= 100%		Np = 80%		Exploitable stems
				Re	MMD	Re	MMD	
CF of Mintom	41455	191	0.005	0	0	0	0	0
CF of Akom II-Efoulam	17226	128	0.007	1.71	110	2.13	110	23
CF of de Messondo	16864	368	0.022	0.33	110	0.42	110	148
CF of Minta	41087	165	0.004	0	0	0	0	0

Titre Concession	Surface area	Total number of stems	Density	Np= 100%		Np = 80%		Exploitable stems
				Re	MMD	Re	MMD	
CF of Mvangan	33720.5	1045	0.031	0.95	90	1.18	90	157
CF of Nyanom Ngambet et Ndom	46875	1102	0.024	0.67	90	0.84	90	149
CF of Yokadouma	22206	109	0.005	0	0	0	0	0
CF of Bengbis	27800	6147	0.221	0.66	70	0.82	70	597
CF of Bipindi et AkomII	23204	199	0.009	0.65	90	0.81	90	66
CF of Ambam	45895	1233	0.027	0.33	80	1.66	60	190
CF of Ngoulmekong et Mengong	10338	59	0.006	0	0	0	0	0
CF of Biwong-Bane	88410.2	589	0.007	1.62	70	2.08	70	74
Concession No 1001, UFA 09-006	74432	184	0.002	0	0	0	0	0
Concession No 1293, FMU 09004a, 09005a, 09005b	183350	6889	0.038	1.86	80	2.33	80	189
Concession No 1050, FMU 09017, 09018	99459	1191	0.012	1.85	90	2.31	90	276
Concession No 1069, FMU 09020	43905	79	0.002	0	0	0	0	0
Concession No 1036, FMU 09019	38247	388	0.010	0.17	110	0.21	110	194
Concession No 1033, FMU 09004b	65675	333	0.005	0	0	0	0	0

Titre Concession	Surface area	Total number of stems	Density	Np= 100%		Np = 80%		Exploitable stems
				Re	MMD	Re	MMD	
Concession No 1064, FMU 09016	54822	2069	0.038	0.39	110	0.49	110	1136
Concession No 1006, 1037 FMU 09-021, 09-024 et 09-025	198361	3329	0.017	0.6	70	0.75	70	290
Concession No 1011, FMU 09025	88147	102	0.001	1	110	1.25	110	10
Concession No FMU 10005A, 10005B	89322	160	0.002	0	0	0	0	0
Concession No 1063, FMU 090013	42402	4782	0.113	1.39	80	1.73	80	302
Concession No 1068, FMU 110021A, 110021B	54529.57	278	0.005	1.09	60	1.36	60	29
Concession No 1028 , FMU 00003	102699	1678	0.016	0	0	0	0	0
Concession No 1091, FMU 070023	38195	1180	0.031	2.75	70	3.44	70	70
Concession No 1063, FMU 09013	51318	318	0.006	0	0	0	0	0
Concession No 1035, FMU 09015	41559	731	0.018	0.48	80	0.6	80	198
Concession No 1064, FMU 09016	64646.32	299	0.005	0	0	0	0	0
Concession No 1005, FMU 09023	51050	272	0.005	0	0	0	0	0
Concession No 1037, FMU 09024	74625.8	4778	0.064	0.63	70	0.79	70	70
Concession No 1081, FMU 09 026 et 09027	18267.04	405	0.022	0	0	0	0	0
Concession No 1007, FMU 10028	62389	92	0.001	0	0	0	0	0
Concession N° 1045, FMU 10 049 et 10 050	70688	4694	0.066	0.36	110	0.45	110	1702
Concession No 1087, FMU 11005	70298	300	0.004	0	0	0	0	0
Concession No 1068, FMU 11 002	72705	441	0.006	0	0	0	0	0
Concession No 1060, FMU 10 064	115900	348	0.003	0	0	0	0	0
Concession No 1086, FMU 11 001	94917	585	0.006	0.67	100	0.83	100	208
Total	**2413429.23**	**48056**		**0.63**	**120**	**0.5**	**110**	**6175**

In some documents of the simple management plans, the total number of stems found in the forest was given without precision on the diameter classes. In the following analysis, only community forests which presented the distribution of the stems in at least two diameter classes were retained for the simulation of the MMD. Table 3 presents the MMD and reconstitution rate of Pink Bubinga in the six community forests which showed stems distributed in different diameter classes. The average density is 0.03 stems/ha. Only one CoF can be subjected to forest logging, the CoF of Adevina, with a total exploitable stems of 58..

Table 3. Densities, reconstitution rate and Minimum managed diameter of Pink Bubinga in Community forests (Source © Betti 2017)

Title of the Community forest	identification number	Surface area (ha)	Number of stems	Density	Re/100%	DMA/NP 100%	Exploitable stems
Adevina	348	5000	638	0,128	0,7	110	58
Odoudouma	332	2366	87	0,037	0	0	0
Defocen	310	2941	6	0,002	0	0	0
Oveng-Yemevong	266	5000	16	0,003	0	0	0
GIC Solidarité		5000	6	0,001	0	0	0
Abbegong	185	5000	3	0,001	0	0	0
Total		**25307**	**756**	**0,030**			**58**

9. Annual Quota

We did nt get any data to calculate the annual quota. This can easily be obtained through data obtained by timber companies through exploitation inventories. These are inventories conducted at 100% of the exploitable resource. The exploitable resource in this case consists of stems of *G. tessmannii* which have met the MMD, the harvesting rate, and the recovery rates as mentioned above. The first volume obtained from those exploitable inventories refers to the harvesting quota. To pass from the harvesting quota to the export/or annual quota made of the sawn wood, the Cameroon Scientific Authority will apply the conversion rate of 40% to the harvesting volume. On that basis, the annual quota will be available by December 2023.

10. Control/monitoring

Before talking about the control and monitoring of Bubinga tree species in Cameroon, it is important to first understand the general elements required by the forestry administration. The basic elements of the monitoring or control system are précised in the arête 222, articles 25 - 49. The monitoring starts in the central administration by the attribution of the forest management unit, the approbation of the document of the management plan, till the external services (provincial delegations) of the forestry administration.

The process of approbation of the management plan of the FMU comprises eight main steps: (1) attribution of the FMU on a competitive basis (adjudication), (2) signature of the preliminary convention (3) sampling design or protocol, to be approved by the forest administration, (4) the management inventory to be approved by the forest administration, (5) the document of the management plan, (6) sub-commission for analysis of the document of the management plan, in charge to examine and issue a technical avis on the contain of the document of the management plan (7), the inter-ministerial commission for approbation of the management plan assisted by an independent observer; (8) the definite convention which aims to implement the management plan.

The sub-commission in charge to examine and issue a technical opinion on the context of the document of the management plan is mainly composed of researchers from different domain (foresters, biologists, socio-economists, jurists, etc.), from the National Agency for the Forest development (ANAFOR), universities, and the Institute for Agricultural Research and Development (IRAD).

The inter-ministerial commission in charge with the approbation of the document of the management plan is composed of: the Director of forests representing the Ministry of forestry and wildlife (MINFOF): president – one representative of the Ministry of territorial administration: member – one representative of the Ministry of planning and territorial management: member – one representative of the Ministry of scientific and technical research: member – the Director of wildlife and protected areas (MINFOF)/: member – the Director of timber promotion and processing (MINFOF): member – the Director of sustainable development of the Ministry of environment and nature protection: member – the provincial Delegate of environment and forestry (MINFOF) of the region where the forest concession is located.

The Committee meets at least twice a year. The evaluations of the implementation of the management plan are realized at the end of each logging unit (5 years), at the end of the convention (15 years), and also at the end of the rotation (30 years). Those evaluations can even be conducted if necessary at any moment of the year, by the competent forest services. The management plan can be revised after every 5 years. Any modification of the management plan can imply the realization of new or complementary inventories.

The development, and implementation of the management plan is a fund demand and many companies have problem to get their forests. By the year 2003, some companies used to develop their management plan, using services of the consulting offices (consortium), and many of those companies did not have the technical know – how, necessary to implement their management plans. One of the innovations made in the forestry sector there after, was the creation in each forest company, a management unit. This unit is directed by a forest engineer who is in charge of the development, the implementation, and the revision of the management plan. **The existence of this unit as far as the qualification of the person in charged to work on it are some criteria also appreciated by the Government for the approbation of the management plan.**

During the preliminary convention, the beginning of activities in a new annual logging plot requires the obtention (detention) of an annual logging certificate. The maximal area to attribute within the year is fixed in conformity with the current legislation. Each annual plot cannot be attributed twice.

During the definite convention, the beginning of logging activities in a new annual plot, or the renewable of a given annual plot requires the obtention (detention) of the annual operation permit. Also, this permit cannot be attributed twice. All felled trees during forest logging activities are noted in a logging book. Sheets of this book also called the "DF10 sheets", are filled every day by the forestry company.

The logging book or the "DF10 sheets" are printed by the forest administration, and sold to regular possessors (holders) of annual permits. The cods (numbers) of sheets allocated to a given company, and for a specific title (annual permit) are registered in the forest data base, settled in the Ministry of Forestry and Wildlife/forest department (SIGIF). Each concessionaire is responsible of the "DF10 sheets" perceived. These sheets can only be used for a specific permit and a specific year for which they have been edited. The codes of sheets that have been destroyed (spoiled) or loss, must be declared by the company to the forest administration, so they can be deleted from the forest data base (SIGIF). The control (monitoring) of "DF 10 sheets" that are in movement within the country, is permanently realized by the forest administration officers, who punish any irregular user.

Any "DF 10 sheet" must contain the logs coming from the same permit (annual logging plot). Every week, the forest logger must put together, sheets belonging to the same group "month of logging – permit" and transmit them to the regional delegation of forestry and wildlife.

Each regrouping sheets constitutes a weekly portion. And a weekly control sheet DF 11, must be annexed to each portion.

The portions are consecutively numbered (codified) per year and per permit. A portion can only contain "DF10 sheets" belonging to the same month of logging. In the section "provenance of timber", the forest logger must precise the councils' names. If the permit covers more than one council, the forest logger will have to indicate the percentage of the area of each council. The forest logger must deposit (transmit) the "DF 10 sheets" not late than 10 days after the end of the logging month, to the regional delegation of forestry and wildlife. The Provincial Delegate has thereafter to deliver the DF10 attestation of deposit to the logger. The compilation of those sheets is done in the provincial delegation of forest/Service of forest database (external SIGIF), before being transmitted to the central forest database in Yaoundé (SIGIF central).

The annual plot is closed to forest logging at the 30th of June of the year. And the company must deposit the annual report of forest interventions (RAIF) not later than the 31th of July of the same year.

11. Participative implementation of the management plan

The implementation of the management plan focuses on three different stake holders: forestry administration, forest company, local population. The management plan must precise how the notion of participative management is applied at the level of the forest concession. It must also describe the mechanisms to resolve conflicts.

In the annex of the document of the management plan, there exists an agreement convention linking the forestry company and the local communities. This agreement states the obligation of the two parties (logger and the population). Local populations are authorized to harvest some products in the forest concessions, mainly composed of non timber forest products such as wild fruits, vegetables, and medicinal plants. They are also allowed to undertake fishing and small scale traditional hunting of small mammals which are authorized by the forest law. Sometimes, local communities are also authorized to conduct small scale agricultural activities, with low impact on timber production. They are committed to work together with the timber company to combat poaching and illegal or "wild" sawing.

The forest logger has to pay regularly his forest taxes, and to contribute to development projects for the benefit of the community. In fact, the social and cultural dimension is one of the important innovations outlined in the Cameroon forest legislation. This dimension states that, the local people may participate to the management of forest resources and may gain some profits of the exploitation of those resources. The concrete measures undertaken by the Cameroon government in this regard are for e.g., the obligation of forest companies to realise certain number of social activities (duties) such as the creation of schools, health centres, etc… for the benefit of local communities, the payment of the annual forest allowance ("Redevance forestière annuelle" in French) by the exploiter. The annual forest allowance is a specific tax that is settled depending on the surface area of the forest under exploitation. Revenues coming from this tax are shared between the public treasury or the forest administration (50%), the local council (40%), and the local communities (10%). When the permit is a sale of standing volume, local communities recense additional informal tax of XAF 1,000 /m^3.

The parts of the forest tax allocated to the council and communities are destined to realise some small development projects at the local level. A specific arête was published by the forest administration to precise the modalities of using those funds. A number of dispositions have been put in place to ensure that the money is effectively used for such projects. The activity reports of councils are regularly sent to the forest administration to monitor the management of the forest revenues.

The forestry administration works to ensure the conservation and development of permanent forests all over the country. His job does not only consist of controlling and monitoring the forest logging activities; but also to protect the loggers against illegal logging done by some villagers in the forest concessions. The forest administration is also committed to plant trees in zones were forests have been destroyed or degraded. All these tasks require alot of money. To enhance the contribution of the forest revenues in the conservation of forests, the Government of Cameroon created the Special Funds for Forests Development (FSDF). The main objective of this fund is to re-inject some parts of the forest revenues in the sustainable management of those forests. The decree n° 96-237-PM of 10 April 1996 fixing the modalities of functioning of this fund states that, the FSDF is a special fund of the public treasury destined to finance the management, conservation, and sustainable development operations of the forest resources. The revenues of the FSDF comes from different sources including: (i) the quote-part of revenues produced by the annual forest tax (RFA), the felling tax, the tax of transfer of a forest concession, the exit tax (at the port), the progressive surtax paid for the exportation of unprocessed or raw products, the price from selling the forest products, penalties, transactions, damages-interests, other selling forms such as selling the seized products, (ii) the recuperation including authorization of gathering logs within the agricultural activities, roads construction, or abandoned logs in the forest, (iii) Revenues affected by the law, (iv) selling of files by the forest concessionaires including forest agreements, permits, (v) selling of administrative documents including the DF10 sheets, the factory entrance book, the way bills book (for logs and for sawn wood), (vi) subventions, contributions, and dons, and others.

Revenues gained from the seized products are shared as follow: 35% goes to feed the public treasury and 65% go to the FSDF. The 65% of the FSDF are furthermore shared as follow: 40% for buying different forest material and equipment (Global positioning systems, maps, tents, etc.), capacity building, or as the Government contribution in the financing of some forest projects (The forest administration has like this contributed to the financing of the recent National forest inventory together with the FAO), 25% are paid to the forest officers who have participated to the control mission that led to the payment of those revenues. Before, the money generated by the selling of seized products was collected by the forest officers and reversed in total to the General Directorate of Taxes (GDT), with the divisions showed above. The problem is that, the GDT did not used to send back the quote parts of the forest administration. That is why, since the month of March 2006, the forestry administration has decided to retain directly the part belonging to its services. And since there, things seem to work well.

The expenditures supported by the FSDF include (i) management of forest reserves, (ii) regeneration of forests, (iii) forest inventory, (iv) materialization of limits of forest concessions and creation of infrastructures, (v) equipments for forest inventories, (vi) technical control and monitoring of forest management in concessions, (vii) dissemination of results of research on forest management, (vii) research in forestry, (viii) functioning of different committee (for agreements, permits, management plans, etc..), (ix) counterpart funds in the forest projects, (x) contribution of the Government to international Institutions, (xi) motivation of the forest agents and officers. The present work was supported like that by the Special fund for forest development.

12. Conservation at the national level/*Protected areas*

Within Cameroon the pinck Bubinga is found in protected areas and forest reserves as followed (table 19):

Table 19: Presence of bubinga tree species in protected areas (source: Onana J.M. pers. comm.)

Bubinga tree species	Distribution in protectected areas according to specimens collections
Guibourtia tessmanii	Mont Cameroon National park; Campo-Ma'an national park, Mungo forest reserve (FR); Bimbia Bonadikombo forest reserve,
G. pellegriniana	Mont Cameroon National park

13. Main threats

Two main threats can be observed for Bubinga species in Cameroon: habitat loss/degradation (human induced) and illegal logging.

- Habitat loss through agricultural activities is considered as one of the main threat on forest biodiversity in Cameroon. Large-scale agriculture and other human activities in the area are leading to the degradation of primary forests (IUCN, 1989), thus causing "vulnerability" of wild plants. According to IUCN (1989), the rate of deforestation in Cameroon is the most high in the Congo basin, with an annual rate of 0.5%.
- Illegal logging is the harvest, transportation, purchase or sale of timber in violation of laws. The harvesting procedure itself may be illegal, including using corrupt means to gain access to forests; extraction without permission or from a protected area; the cutting of protected species; or the extraction of timber above the agreed limits. Illegalities may also occur during transport, such as illegal processing and export; fraudulent custom declaration; and the avoidance of taxes and other charges.

14. Precautionary principle

In Cameroon, Bubinga can be logged at diameter 80, 90, 100, 110, or 120 cm depending to the reconstitution rate and the harvesting rate obtained in a given production forest. The analyses done suggested to limit a MMD for the pink Bubinga (*G. tessmannii*) at 110 cm. The precautionary principle imposes to reduce the harvesting rate from 100% to 80%, with the view to keep good and healthy mother trees for the resource regeneration. The precautionary principle also guide to limit the export quota to managed production forests considered as the forests which have fair management plans. These include FMUs, CFs, and CoFs. Finally, the precautionary principle imposed to limit the harvesting of Bubinga tree species in production forests with good and regular diameter structure. To this end, we retained for the Pink Bubinga, 16 out of the 39 CFs and FMUs and 1 out of the 06 CoFs; while for the red Bubinga, we retained 23 out of the 34 CFs and FMUs and 10 out of the 25 CoFs.

Recommendations

The knowledge of the occurency and occupancy maps, densities and stand volumes, the clarification of the harvesting diameter, the reduction of the harvesting rate with the aim to increase the number of mother trees to be left in the forest, and the definition of the stand volume and sawn wood to be harvested annually together with the important achievements made by the Cameroon Government in the forest sector in general and in the Bubinga supply-chain in particular (banning of logging in non managed forests and managed forest with low densities, punishment of corrupt agents and officers, collaboration between the forestry and the customs administration) are all necessary tools which ensure that international trade on Bubinga products is currently non-detrimental to the survival of the resource in Cameroon. For this assertion to be completely admitted, the following recommendations are made:

- Enhance Cameroon officers and foresters capacity in identifying clearly the Pinck Bubinga tree species;
- Consider a special silvicultural regime for *G. tessmannii*
- To instruct for the coming years the realization of exploitation inventories starting from 25 cm in diameter in order to allow the realization of a distribution curve in each open Annual Cutting Permit (AAC) as recommended by the European Union;
- Provide adequate resources for the optimal functioning of the Scientific Authority in this year 2023.
- Promote the use and trade of other species of *Guibourti*a with similar properties to Bubinga in order to reduce the pressure on pink Bubinga, especially *Guibourtia tessmannii*.

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REPUBLICA DE GUINEA ECUATORIAL
MINISTERIO DE BOSQUES Y MEDIOAMBIENTE

A la AUTORIDAD ADMINISTRATIVA CITES DE GUINEA ECUATORIAL
Malabo

Asunto: *Informe del Examen de la Existencia de la especie Guibourtia tessmannii (BUBINGA) en relación a su exportación en Guinea Ecuatorial.*

1. Marco legal de la especie de *Guibourtia tessmannii* en Guinea Ecuatorial

1) En el Decreto nº 97/1997, de 12 de agosto, por el que se aprueba el Reglamento de Aplicación de la Ley de Uso y Manejo de los Bosques en Guinea Ecuatorial, en su Artículo nº 60, dice textualmente "por su valor artesanal y cultural o por su rareza en el territorio nacional, el apeo de las especie *Guibourtia tessmannii* (Bubinga u Oveng) se hará mediante una autorización especial otorgada por el Ministerio del ramo; quedando totalmente prohibida su exportación en rollo o aserrada, salvo bajo una Autorización del Gobierno. Para ello, las exportaciones realizadas son Autorizadas por el Gobierno.
2) A nivel de la Convención sobre el comercio internacional de las especies de fauna y flora silvestre amenazadas de extinción (CITES), que la Republica de Guinea Ecuatorial adhirió el 10 de marzo de 1992, cuyo objetivo es Controlar los intercambios internacionales de especies animales y vegetales que son, o podrán ser, amenazadas de sobre explotación. Por lo que, todas las exportaciones de la especie en cuestión, tienen una Autorización CITES firmada por la Autoridad Nacional CITES de Guinea Ecuatorial.

1. Hábitat Ecológica y características biológicas de la especie *Guibourtia tessmannii* o BUBINGA

La especie es de la Familia CAESALPINIACEAE O FABACEAE. Se localiza en la Región Guineo-congolesa, en los bosques densos húmedos de Camerún, Guinea Ecuatorial, Gabón, Congo, República Democrática de Congo y la República Centroafricana. *Guibourtia pellegriniana, Guibourtia tessmannii y Guibourtia ehie* son las especies de los bosques densos húmedos ecuatoriales de África central (Vivien et al., 1985; Laird et al., 1996), las cuales se encuentran en la Republica de Guinea Ecuatorial, son especies que exigen la luz intermediaria

(Doucet, 2003). Las especies *Guibourtia pellegriniana* y *Guibourtia tessmannii* son parecidos en el bosque y se confunden mucho, llamando todos BUBINGA (*Guibourtia tessmannii).*

Tanto *G. tessmannii* que *G. pellegriniana*, fructifican tanto en la época lluviosa que en la seca según la localidad (Gabón, Camerún y Guinea Ecuatorial).

Los principales diseminadores de OVENG en estado natural son: abejas (*Apis mellifera adansonii*) a través de los pólenes. La dispersión de tipo zoocore a través de *Cricetomys emini* (rata), *Cercopitthecus nictitan nictitan* (mono), *Mandrillus sphinx* (mandril), Aves (*Corythaeola cristata (Turaco), Ceratogymna atrata (Ngung)*, etc.). Estas especies, abundan en diferentes ecosistemas de Guinea Ecuatorial. Es una especie semi-heliofila, cuyo periodo de fructificación es de diciembre a marzo.

2. Disponibilidad actual de la especie *Guibourtia tessmannii* o BUBINGA en Guinea Ecuatorial

Las densidades de palos de *Guibourtia tessmannii* en Guinea Ecuatorial (en la Región Continental) se estiman según el **nuevo Inventario Forestal Nacional**, que está llevando el país en estos precisos momentos, se trata de proyecto de la FAO: **GCP/EQG/017/GEF 2020-2023, GEF ID:10120, bajo titulo: Mejora de la capacidad institucional y técnica de Guinea Ecuatorial en el sector agricultura, silvicultura y otros usos de la tierra para una mayor transparencia en virtud del Acuerdo de Paris.**

Metodología

Sobre un total de 142 unidades de muestreo, cada una de 1 hectárea (100 m x 100 m), es decir 142 hectáreas. En ellas, se ha restado unas 12 hectáreas corresponde a las Islas de Bioko y Annobón, por no ser áreas de distribución natural de la especie, y se ha quedado con 130 hectáreas de unidades de muestreo en toda la Región Continental.

Figura 1. Distribución de las Unidades de Muestreo en todo el País.

Resultados

Que, se han inventariado 10 árboles de grandes diámetros de la especie en 7 localidades diferentes, encontrados alrededor y dentro de las parcelas del Inventario Forestal. Por lo que la densidad de árboles en 130 hectáreas de muestreo es de **0,077 árboles/hectárea**.

Tabla 1. Localización de los arboles de la especie de *Guibourtia tessmannii* y sus diámetros a la altura del pecho (DAP) encontrados en el Inventario Forestal Nacional 2020-2023.

Especie	Poblado	Nº de Palos	DAP
BUBINGA	MBÉ BOSQUE (EVINAYONG)	1	> 110 CM
BUBINGA	NFAMAN (AÑISOK)	1	> 120 CM
BUBINGA	CORO ESENG (NIEFANG)	1	> 150 CM
BUBINGA	OVENG ESADON (AÑISOK)	1	> 125 CM
BUBINGA	BISONG (EVINAYONG)	1	> 135 CM
BUBINGA	ESONG (NSORK)	1	> 120 CM
BUBINGA	MISONG-MINVI	4	> 110 CM, > 120 CM, > 125 CM
TOTAL		10	

La superficie total de los bosques de producción forestal de la Región Continental es de 820.000 hectáreas (con una estimación total de **63.140 árboles**) y de 515.000 hectáreas en bosque de conservación (con una estimación total de **39.655 árboles**), llegando a una superficie total de 1.335.000 hectáreas.

Por otra parte, en Guinea Ecuatorial se esta realizando ensayos de plantación de la especie *Guibourtia tessmannii* mezclados con otras especies como *Diospyros crassiflora, Baillonela toxisperma* y *Aucoumea klaineana* en la isla de Bioko, especies plantadas fuera de su área de distribución natural, de entre las 57 plantas de estas especies introducidas en el sistema agrosilvopastoral, 33 árboles corresponden a BUBINGA (*Guibourtia tessmannii), que* están creciendo sin novedad durante 10 años, en una superficie de 70 hectáreas; resultando un **crecimiento medio diametral de 0,033 cm anual y, un crecimiento en cuanto a la altura de 0,28 cm anual.**

Conclusiones

Por lo tanto, el total de árboles estimado en esta superficie es de **102.795 árboles en pie con diámetros a la altura del pecho (DBH) mayor o igual a 110 centímetros.** Aquí no se ha tenido en cuenta los árboles con diámetros menores a 100 centímetros ni la regeneración.

Los ensayos de plantación de la especie fuera de su hábitat natural (en la isla de Bioko de Guinea Ecuatorial, sobre 33 árboles corresponden a *Guibourtia tessmannii,* que están creciendo durante 10 años sin problemas, en una superficie de 70 hectáreas; resultando un **crecimiento medio diametral de 0,033 cm anual y, un crecimiento en cuanto a la altura de 0,28 cm anual.**

Mientras que a nivel de grandes arboles explotables, en comparación con los países limítrofes, tenemos que el crecimiento diametral de dicha especie a través de estudios de anillos de crecimientos según estaciones lluviosas y secas, muestra que en Camerún crece 0,45 cm al año, en Gabón, 0,35 cm al año y, en la República de Guinea Ecuatorial que está en el medio de los dos países, 0,40 cm al año.

La República de Guinea Ecuatorial da mucha importancia a la especie, debido a sus usos tradicionales, de hecho, se gestiona de manera sostenible, ya que los diámetros utilizados en ciertas exportaciones están en el rango admitido por la legislación nacional, por lo tanto, la explotación bajo autorizaciones, aun no compromete la supervivencia de la especie.

Bata, 16 del mes de agosto de 2023

Autoridad Nacional Científica

MINISTRY OF ENVIRONMENT AND FORESTRY REPUBLIC OF INDONESIA
DIRECTORATE GENERAL NATURAL RESOURCES AND ECOSYSTEM CONSERVATION
DIRECTORATE OF BIODIVERSITY CONSERVATION OF SPECIES AND GENETIC
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Our Ref:S. 539 /KKHSG/PSG1/KSA.2/8/2023

14 August 2023

To: **Ms. Ivonne Higuero**
CITES Secretariat
International Environment House
Chemin des Anemones
CH-1219 Chatelaine Geneva
Switzerland
Email: info@cites.org

Subject: CITES PC26 Review of Significant Trade: Exports of *Aquilaria malaccensis* and *Gyrinops* spp. from Indonesia

Dear Madam,

Referring to your email dated 4th August 2023 regarding the above mention and the result of document executive summary the twenty-sixth meeting of the Plant Committee, the species of *A. malaccensis* and *Gyrinops* spp. from Indonesia is recommended for inclusion in Stage 2 of the Review of Significant Trade. For *A. malaccensis*, Indonesia is requested to provide information the source code of export and the scientific basis by which Indonesia established that exports of *A. malaccensis* are not detrimental to the survival of the species concerned and are compliant with Article IV of CITES. Thus, please kindly find the document response of the Review of Significant Trade for *A. malaccensis* and *Gyrinops* spp. as attached for your perusal.

Thank you for your kind attention and consideration.

Yours sincerely,

Indra Exploitasia, DVM
Interim Director of Biodiversity Conservation of Species and Genetic Email: subditkonvensi.kkh@gmail.com, dit.kkh@gmail.com

CC :

1. Director General of Natural Resources and Ecosystem Conservation, MoEF;
2. Permanent Mission of The Republic of Indonesia to the UN, WTO, and Other International Organization in Geneva, MoFA;
3. Director of Secretariat of Scientific Authority for Biodiversity.

Assessment of the trade of specimen with source code "W" for the species *Aquilaria malaccencis*

I. Non-Detriment Finding Process

The Scientific Authority (SA) establishes teams for evaluating trade of plant species, consisting of personnels from different research centres in the National Research and Innovation Agency (Indonesian: Badan Riset dan Inovasi Nasional-BRIN) and some personnels from the Management Authority (MA) of the Ministry of Environment and Forestry. The team gathers information from various sources, verified their validity at its best, based on scientific principles, and categorized their degree of reliability. Verification is carried out through discussions and visits to points of production, and documentation. Information and results of studies are often obtained sequentially, in accordance with the process and dynamics of trading activities.

The Management Authority (MA) and their field officers are SA's principal teammates in compiling the data, and prepare the assessment and reports. They are maintaining historical records of trade licensing and corresponding activities. Another contributor who also plays the role in acquiring relevant data and information is the trader association. They hold documentation of their members' activities and often facilitate visit to processing sites. Other researchers from BRIN and universities are also involved in field studies on different aspects.

The SA and MA evaluate the imposed annual quota for appendix II species by conducting several meetings and data gathering, starting in the eighth and ninth months of each year. The latest quota and the number of products used were obtained from the records of permit letters that have been granted become the starting point to set the annual quota. Whenever necessary, extra field inspection would be suggested by the SA to the field officers whose results will be reported as additional data/information to be discussed in the final meeting. The evaluation result will become the bases for the quota setting for the following years.

II. Review of the population

Aquilaria malaccensis is one of the agarwood species from the genus *Aquilaria*, Thymelaeaceae. There are 13 species of agarwood belonging to two genera, i.e., *Aquilaria* and *Gyrinops* that are distributed throughout Indonesia. According to Plant of World Online (PoWO) (2023) *A. malaccensis* has homotypic synonyms as *Agallochum malaccense* (Lam.) Kuntze in Revis. Gen. Pl. 1: 283 (1891) and *Aquilaria malaccensis* (Lam.) Tiegh. in Bull. Soc. Bot. France 40: 77 (1893). The common or trade name for this species are agar, agarwood, eaglewood, Indian aloeswood, Malayan eaglewood tree, aloeswood, lign-aloes (English), *kayu karas*, *gaharu*, *garu* (Indonesia), *halim* (Lampung), *alim* (Batak), *kareh* (Minang), *mengkaras*, *calabac*, *karas*, *kekaras* (Dayak), *galoop* (Melayu) dan *seringak* (GBIF 2023; Susilo et. al. 2014).

This species is native to Assam, Bangladesh, Borneo, East Himalaya, Malaya, Myanmar, Philippines, Sumatera, Thailand, Vietnam (PoWO (2023), Harvey-Brown (2018)); Bhutan; India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura); Singapore, while its presence in Sarawak needs confirmation (J. Sang pers. comm. 2018 in Harvey-Brown, 2018). In Indonesia, the range distribution of *A. malaccensis* is in the western part of the country i.e., Sumatra and Kalimantan. However, based on the herbarium, this species has also been collected from small islands near Sumatra e.i: Bangka, Belitung, Karimun and Singkep.

Species of *Aquilaria* may grow next to each other, for example, *A. malaccensis* dan *A. microcarpa* is found in the same area in Riau and Bengkulu. Those species may thrive in a kind environment. Meanwhile, seedling and adult trees without flowers or fruit are hardly distinguished. Adult *A. microcarpa* has smaller leaf size compared to *A. malaccencis*, but in other observations in different locations, both leaf sizes are similar. This identification issue is recognized as one of the main topic to be addressed in its taxonomical research.

Generally, *A. malaccensis* can be found in forests from lowland up to submontane ecosystems at the elevation 0-1000 m. It grows in areas with 20-33 ºC temperature, 60-100% of humidity, 56-75% light intensity, 0-50% of slope, 6.4-7 of soil pH, and 10-75% of soil humidity, with rain intensity 1.200-2.000 mm/year (Sumarna, 2008; Pribadi, 2009; CITES, 2003 & Harvey-Brown, 2018). This species may grow in rocky, sandy, or calcareous soils, well-drained slopes, and ridges, or areas near swamps. This species can also occur as an emergent tree (Page and Awarau, 2012). *A. malaccensis* starts to produce flowers and seeds at > 20 cm in diameter, or between 6 - 10 years after planting. They are reported to produce thousands of seeds during one fruiting period. Based on a field survey carried out in 2009, *A. beccariana* and *A. malaccensis* produce fruits from sapling stage at < 10 cm diameter. Paoli et al. (2001) recorded that in the natural forest in Kalimantan, trees that have reached reproductive maturity start at approximately 35 cm in diameter.

In Indonesia, agarwood *A. malaccensis* may be found in the forest (state forest and community forest) or non-forest areas (Figure 1, 2, 3, 4, & 5). At the state forest area, this species grows both in the conservation area (e.i., natural reserve or national parks) and in the production forest. In the past, people hunted agarwood only in the production forest of Kalimantan and Sumatra, and spent weeks to months. The resulted gathering is known as wild agarwood. Currently, there are sporadic land-use changes. This has caused forested areas for hunting agarwood to become less. The lands are turned into palm oil or rubber plantations (Figure 2). However, agarwood trees in such plantations were left to grow naturally and maintained along with the main crop. Trees in these areas receive no special treatment, other than regular nurture and checking. Whenever the main stem of the trees is found to contain resin, the owner of the land would have them harvested.

Figure 1. Wild of *A. malaccensis* in community forest, Siak Regency, Riau Province

Agarwood has a high economic value because of their resin content. The trees would release aromatic substances, known as resin inside the wood, whenever they are infected by some particular fungi (e.i., *Fusarium*). The presence of resin is signed by some dark layers that form a distinct pattern and aroma to the wood. In plantation or "assisted production" area, the farmer makes some physical treatment to the stem i.e., injection, peeling the bark, nailing, etc., and applies chemical substance, or inoculation material composed of Fusarium fungi., or even agarwood resin from other trees. These treatments are expected to drive the resin formation in the heartwood. Wood that contains resin is harvested and further proceeds as raw material for cosmetic ingredients, medicine, perfumes, incense, insect repellent, as well as for preservative other products and accessories.

As inoculation methods are getting popular, more people in the community are trying to cultivate the agarwood in the plantation for subsequent inoculation experiments. Land owners might obtain seedlings from other areas, nurture the plant (fertilizing, watering, pruning, etc.) to a certain size that is thought would be ready to be inoculated. These people usually try to use high quality seedlings and work the land to make it suitable for supporting the agarwood growth. The agarwood seedlings are shading tolerant, but require sufficient sunlight to grow to adult stages. In Sumatra, agarwood is planted around palm trees at the age of 4 years with 8 cm in diameter (Suhartini, 2009). They are also found between trees in rubber and timber plantations.

Figure 2. Agarwood "assisted production" (*A. malaccensis*) with palm oil in Bengkalis Regency, Riau Province (a) and agarwood partly "assisted production" and cultivated with rubber in Bengkulu Province (b).

Based on research in the last 15 years, the wild population of *A. malaccensis* in several areas in western Indonesia ranges from 0.5 to 8 individuals per hectare. Sumarna (2008) reported that in Tabir Ulu District Forest, Merangin Regency, Jambi Province, there were seven trees per unit group of elevation distribution (<100 m, 200 m, >200 m) and 287 seedlings of *A. malaccensis* found around the parental tree. The number of these seedlings will decrease in the next living phase (saplings and poles) as the competition for space is rising. Although seed production was reported to be high in Indonesia, the germination rate is considered to be low and seed dispersal was limited (Turjaman et al., 2016). Setyawati (2010) said that from 50 plots sized (10m x 10m) in a survey area, there were only five plots with *A. malaccensis* trees, sized 20 cm, 25 cm, 28 cm, 30 cm and 34 cm in diameter respectively. pole level was not found. Only one sapling and three plots contain seedlings in the amount of 30, 85 and 102 respectively. The research which conducted by Partomihardjo et. al (2010) mentioned there was population of *A. malaccensis* and *A. beccariana* in natural forest of PLG Bengkulu approximately 10 ind/Ha and in Tahura Bengkulu Forest Park were 11 trees with diameter >50 cm. Meanwhile, in the Bangka-Belitung region, Yulizah et.al (2019) reported that there were nine individual trees of *A. malaccensis* with a density of 0.8 individuals/ha in Mount Maras National Park.

Meanwhile in Kalimantan, based on the research by Abdurachman (2009), there were 29 wild agarwood-producing trees (*A. malaccensis*) in the STREK Labanan Research Plot, Berau, East Kalimantan, covering an area of 48 ha. The wild agarwood tree density was 0.5 ind/ha. Furthermore Pribadi (2009) stated that in Kutai National Park there were 37 points of wild *A. malaccensis* in an area of 4883.75 Ha. The number of mature stands is always less than younger stages, considering that this species needs shades at the seedling stage but requires sufficient sunlight as they grow taller.

In the last 5 years, the "assisted production" population of *A. malaccensis* in Riau was recorded to have population density at most 8.13 individual/ha in Pericit Village and 0.58 individual/ha in Gosib, Siak Indrapura Regency. *A. malaccensis* was found in home gardens and plantations near the village (Yulizah et. al. 2022). People in these village obtain seedling from a mother tree in the nearby forest park (Figure 1). While, Setyawati (2010) reported that *A. malaccensis* stands in Central Lampung and West Lampung were found in cultivation areas where agarwood trees grow naturally on their land. In Bengkulu, Partomihardjo, et al. (2010) wrote there were 20 trees of *A. malaccensis* in farm garden in Bengkulu. Lately, Yulizah et. al (2019), also recorded population densities in Bangka-Belitung region i.e., about 0.14 individuals/ha in Pelangas Village; 4.1 individuals/ha in Lubuk Factory Village, and 2.7 individuals/ha in Serdang Village. The "assisted production" agarwood which was found in these villages is associated with palm oil, rubber, pepper and other tree plantations located in production forest areas.

Wild population of *A.malaccensis* in the western part of Indonesia is assumed to be decreasing as its natural habitat is also decreasing, indicated by the shrinking forest cover, especially in Sumatra and Kalimantan. Currently, most of the agarwood is harvested from areas owned by the community that are adjacent to the forest. Such population is left to grow naturally and harvested when it contains resin with trees that have reached a minimum bole diameter of 20 cm.

A species distribution model using maximum entropy algorithm found that the suitable habitat for *A. malaccensis* in Indonesia is around 26.45 million ha and moderately suitable around 30.48 million ha (In-prep, 2023). Based on the World Database on Protected Area, there is about 11.17 % of suitable habitat and 12.36 % of moderately suitable habitat that is found in conservation areas. The rest are found in non-conservation areas such as plantations, agriculture, or even in settlements. The suitable areas have *acrisols*, *ferralsols*, *gleysols*, *histosols*, and *nitosols* types of soil. Based on this result, the areal with suitable areas are still large, especially for developing new agarwood plantation.

Since the 2000s, there have been some attempts of planting agarwood in Bangka Belitung up to three million stands (Yulizah et. al., 2019). Similar trials also developed in other islands in western part of Indonesia (Figure 3, 4 & 5). Turjaman & Hidayat (2017) mentioned that the total population of planted agarwood in Indonesia is estimated to be about 3.4 million trees. Area with the highest number of estimated populations was Central Kalimantan (0.8 million trees), while the lowest was Jambi (818 trees). Sumatra and Kalimantan Island contribute more than 85% of agarwood plantations in Indonesia (Turjaman & Hidayat, 2017).

Based on the registration data recorded by the Management Authority, there are 31 agarwood farmers with the total number of *A.malaccensis* stands being 31,434 trees in the total area 74.94 hectares. It spreads out in Riau, South Sumatra, Bengkulu, Jambi and East Kalimantan. Not many owners of planted agarwood have registered their stands since such an administrative process is deemed to be tedious and time consuming. Although planting agarwood today is not as popular as ten years ago, most people would keep and nurse stands of agarwood that grow in their lands in the hope for future return.

Figure 3. Agarwood *Aquilaria malaccensis* plantation in Trubus Village, Central Bangka Regency, Bangka-Belitung

Figure 4. Agarwood *Aquilaria malaccensis* plantation in Langkat, North Sumatra

Figure 5. Agarwood *Aquilaria malaccensis* plantation in Siak Regency, Riau

III. Threats

The major threats to *Aquilaria malaccensis* are as follows:

1. There are non-official reports of Illegal harvest from the community that live around the forest area. However, its trends have been declining due to the lower return and higher uncertainties of product availability compared to capital invested. On the other hand, forest rangers are increasing their patrols where the species occurred and monitors product distribution.

2. Lowland forested areas where the species were naturally distributed were converted to mining concessions, palm oil plantations, farms, and settlements.

3. Fungal and pest attacks, (esp *Heortia vitessoides*) were observed in several nurseries which were dedicated for replanting and farming areas. However, studies have shown that certain practices have effectively managed these threats.

These major threats were considerably managed due to great exposure on the species' products. Authorities have been promoting and supporting the species cultivation in various types of land use over the last decade. Local authorities have developed several Forest Management Unit (FMU/KPH) to coop with agarwood production, along with mixed planting in palm plantation, community's forest and farms.

IV. Trade of the specimens

a) Information on the levels of legal trade in the species in the 5 most recent years

Trade in agarwood is controlled with a quota, set on the basis of combined category, i.e., species group and distribution area. *A. malaccensis* specimens are obtained from areas in Sumatra and Kalimantan. Those specimens may be sourced from wild populations, "assisted production" areas and plantations (registered or non-registered). Exported products consist of wood chips, oil, exhausted or non-exhausted powder, and decorative carvings (Figure 6). Most wood chips are processed in Java. Raw wood material with low- to no-resin content transported from harvest location (Figure 7) to wood processing workshops in the same province or directly to Java. Logs are turned to chips, sorted and refined to shape as ordered. These chips then are being enhanced by an impregnation process to contain a higher percentage of resin (Figure 10). The resins are extracted from some low resin-content wood or known as decaying logs from Papua. Decaying log is dead wood harvested from the lowland freshwater swamp in Regency Asmat and Mappi in the southern part of Papua Province (Figure 8). The area was once an active forest concession in the 80s, extracted for their valuable timber that was then abandoned. There are logs of deemed non-valuable wood, sank in the mud which later were found to contain aromatic substances and known by the locals as decaying logs. Extraction of these decaying logs is controlled by quota in the last four years. (Figure 10).

Figure 6. Agarwood products chips (a), non exhausted powder (b), decorative log (c), oil (d), exhausted powder (e).

Figure 7. Agarwood harvested from an " assisted production" in Bengkulu

Figure 8. Decaying logs from Mappi and Asmat, Papua Province

Harvest quotas are set for individual provinces based on available information on standing stock of all types of population, harvest location distribution, permit-holder performance in trading (shown by how their shared quota is taken up) and subsequent proposal. The level of trade for the last five years is as reported in annual reports (Table 1 and Figure 9), which are based on issued permits.

Quota for *A. malaccensis* in the last five years are set to continuously be lower in the following years, in order to stimulate workers to register standing stock in their plantation or farmland. National regulation requires that specimens declared as "non-wild harvest" must be verified and only be taken from registered plantations/farmland. Many people that own planted agarwood, especially those with a small number of trees, hold back to register as they consider the administration is exhausting. Such assumptions lead to alternative distribution of specimens through the established management that is controlled by means of quota. With current productivity, this quota is mostly taken up (Figure 9).

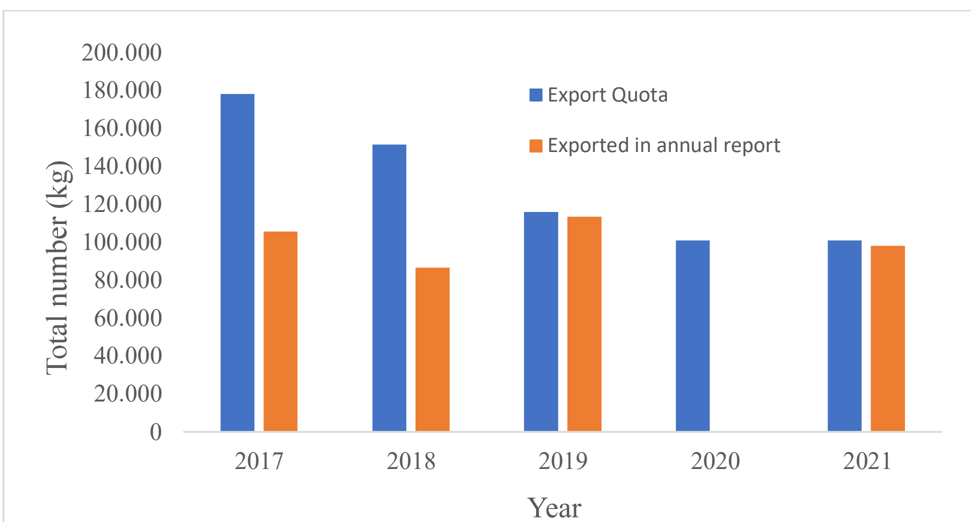

Figure 9. Quota of *A. malaccensis* 2017-2021

Figure 10. The processing of impregnated woods.

b) Levels of illegal trade

There are no reports of illegal trade in 2017 and 2018. Only one instance recorded for no-legal document transportation of agarwood in 2019, three instances recorded in 2020 as well as 2021. These instances involve very small amounts of agarwood compared to the legal ones.

c) Information on procedures for identification of specimens in trade to the species level.

Products of agarwood that are traded across the border, predominantly in the form of chips, some portion of powder, oil, decorative carving and finished products such as incense. These end products are similar in shape between species. However, the identification to the species level can be trace from the transport documents, particularly for specimens from the wild, registered hunters would be required to describe their finding to their collector/dealer who must include such information in the permit submission. The most workable identification is at the beginning of harvest. Standing stock are distinguishable morphologically from their flower, fruit, leaf and wood fiber. Many people in villages plant *A. malaccencis* as this species has the most abundant seedling and is more preferred in the market. For specimens from the wild, registered hunters would be required to describe their finding to their collector/dealer who must include such information in the permit submission.

d) Information on any export quota in place for the species and details for 5 most recent years.

All of the export quotas have been published on the CITES website except for 2019. Table 1 shows that in most of the years, the amount of exports, according to the CITES trade database, are less than export quota, as also recorded in the annual reports, except for 2017 where the quota was fully taken up. However, the exported amount for 2021 shown in the CITES trade database is different from the annual report, amounting to 68 kg discrepancies. The cause of this discrepancy is unknown.

Table 1. Quota and exported in annual permit amount of *A. malaccensis*

Year	Export Quota (kg)	Exported (kg) in CITES Trade database	Exported (kg) in Annual report
2017	178,500	105,736	105,736
2018	151,725	86,448	86,648
2019	116,069	113,467	113,645
2020	101,000	98,241	98,750
2021	101,000	98,297	98,229

e) Information on artificially propagated specimens is distinguished in trade from wild-harvested specimens.

Agarwood specimens are exported mostly in the form of wood chips and small portions of oil, powder or finished products such as assorted incense and decorative carvings (Figure 6). Similar to distinguishing species, most of these specimens are not readily differentiated between wild-sourced with those of non-wild-sourced. Wild-sourced wood chips might be differentiated by their irregular size and shape with dark color (Figure 11a), while processed wood chips derived from plantation or "assisted production" trees are often packed in similar size and shape, some with rather brownish colour but might also be darker (Figure 11b-e). Powder is served as material for oil extraction while exhausted powder is a form of remains from such extraction and used in production of a variety of incense (Figure 6). They are made from wood with low contained resin, usually derived from plantation or assisted production trees in which the wood is light in colour (light brown).

Figure 11. *A. malaccensis* chips from wild (a), from “assisted production” and plantation (b), (c), (d), (e).

Agarwood trees that contain a decent percentage of resin are randomly found in the deep forest. Only persons with particular skill are able to identify such individual trees right away, of which the number is very few and old. A hunting session would require a long distance taken by foot and about a month of exploration. This condition has made hunting agarwood become a highly-cost activity (Hidayat, et. al., 2020). On the other hand, agarwood trees with effortless access in kampongs (villages), farmland, rubber and palm-oil plantations are readily available (Figure 2). Many people in Sumatra and Kalimantan plant them in quite a number where the seedlings were obtained freely from the local government in 2011-2012. Logs and various sizes of chips with low- to no-content of resin derived from harvested standing stock that grows in these areas are sent to Java for further enhancement process (see Figure 6 and Figure 10). Shipment of these specimens would require inspection by local field officers authorized to grant domestic transport permits (SATS-DN). This upstream documentation becomes the main reference for differentiating specimens in the following pathway.

V. Species Management

Species management of *A. malaccensis* exported with source code W is implemented by imposing an annual quota. The quota is set based on available information on population, distribution, level of trade activities per province, indicated by previous years used quota and proposed quota for the following years. The mechanism of setting quota is outlined in Figure 12.

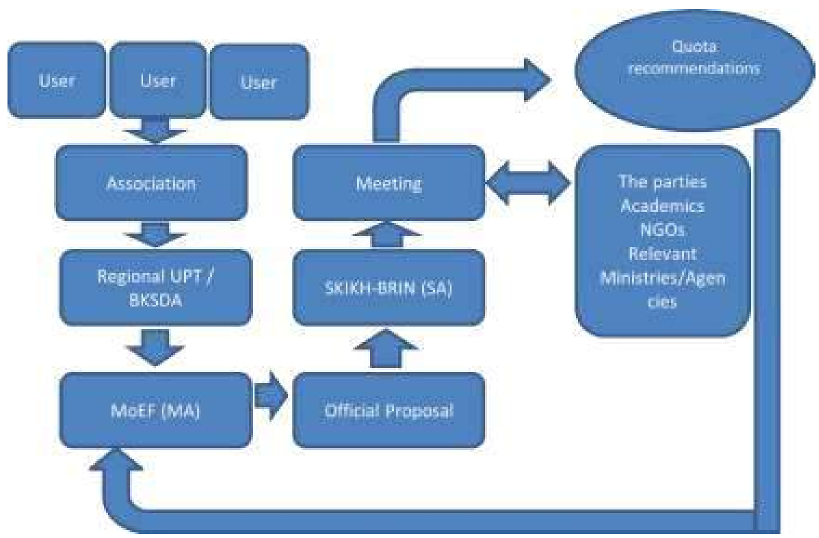

Figure 12. The Proposed harvested Quota of Wild Plant and Animal Species Flowchart

The quota is distributed to domestic permit holders who operate in specific harvest areas. Permit holders usually employ several registered agarwood hunters. These hunters are varied in skill, and can be categorized as forest and non-forest hunter. Those who operate in non-forest areas would differentiate between registered and non-registered plantations.

Stands in registered plantations can be harvested following verification by the local officer. There is no quota being imposed for agarwood produced in registered plantations but verification would be essential to confirm that the amount of harvest is corresponded with the size of specified population. There are administrative requirements that are deemed to be exhausting which hesitate owners to register their plantation.

The permit holder is the one who handles the administrative submission for transporting agarwood. Every consignment from the source location to another point of transport and so forth, must be accompanied by an appropriate transport permit (SATS-DN) which states the type and amount of the package, date and locations of transport. This transport permit must be based on minutes of inspection (BAP) written by authorized officers which verified the actual physical consignment to be transported as declared by permit holders. Both documents must be produced at every point of transport and any changes to the consignment must be declared, which includes the transformation of raw material to products. The term raw material means low- or no-resin content of agarwood, that through some process, is being transformed to product, in one or more processing facilities. The product might be in the form of wood chips of varying qualities, oil, powder, decorative carvings and various shapes of incense (Figure 6). A domestic permit holder might also be an export permit holder. An export permit (SATS-LN) or CITES permit can only be granted based on a correct domestic transport permit (SATS-DN) and correct minutes of inspection (BAP). These transport documents also become the tool for local authority (BKSDA) to monitor the utilization of quota and evaluate performance of a permit holder. The CITES permit became a required document for wildlife export-import activities in the single window permit system established by the government. Please see Figure 13 for the complete procedure.

The following illustration is an example of yield calculation of agarwood from a plantation in Merangin Regency in Jambi Province. A log of agarwood with bole diameter 26.1 cm and 15 m long, would weigh 191 kg. With a known water content of 46.3% (Wiriadinata, et. al., 2010), such a log would have 102.57 kg dry weight. A monoculture plantation would contain 1111 individual trees/ha, while in a mixed plantation with palm-oil trees 333 individual trees/ha. For an annual quota (in this example, year 2021) 101000 kg, there will be 985 individual trees at correct size being felled. Such an amount might be expected from 0.89 ha of monoculture plantation or 2.95 ha of mixed (palm oil) plantation. Suppose that every log is anticipated to contain only 10% resin from such dry weight, there will be 9,847 trees being harvested. This number might be expected from 8.86 ha monoculture plantation or 29.54 ha mixed (palm oil) plantation. This number would readily be met by plantations in Sumatra only. Further elaboration for estimation of harvested agarwood and its corresponding imposed quota between 2017 to 2021 is presented in Table 2.

Table 2. Estimated area and number of harvested trees for its corresponding quota.

Year	Annual quota (kg)	Number of trees (for such dried weight)	Area (for such dried weight, in ha)		With assumption only 10% resin per dried weight		
					Number of trees	Area(ha)	
			Monoculture plantation	Assisted production		Monoculture plantation	Assisted production
2017	178500	1740.32	1.5663	5.2210	17403.25	15.6629	52.2098
2018	151725	1479.27	1.3313	4.4378	14792.76	13.3135	44.3783
2019	128966	1257.38	1.1316	3.7721	12573.82	11.3164	37.7215
2020	128966	1257.38	1.1316	3.7721	12573.82	11.3164	37.7215
2021	101000	984.72	0.8862	2.9542	9847.22	8.8625	29.5417

VI. Law and Regulation

National regulation for utilization of wild plants and animals is mostly contained in the Minister of Environment and Forestry (MoEF) regulation as this ministry is assigned to coordinate CITES implementation and govern Appendix II species management. Those regulations are as follow:

1. Law No. 5/1990 on Conservation of Biotic Natural Resources and Ecosystems
2. Government Regulation No. 7/1999 on the Preserving Plant and Animal Species.
3. Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species.
4. Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.
5. Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals.
6. Directorate General of Forest Protection and Nature Conservation Regulation No. P.25/IV-SET/ 2014 on Administration of Agarwood Plantation Registration
7. Minister of Trade Regulation No.18 Year of 2021 Jo Minister of Trade Regulation 40 Year of 2022 on Export Prohibited Goods and Import Prohibited Goods
8. Minister of Trade Regulation No.19 Year of 2021 Jo Minister of Trade Regulation No.12 Year of 2022 on Export Policy and Regulation
9. Minister of Finance Decree No. 1821/KM.4/2019 on List of Restricted Goods for Export Based on the Minister of Trade Regulation No. 122 of 2018

Based on Government Regulation No. 7/1999 on the Preserving Plant and Animal Species dan Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals stated that agarwood is listed as an unprotected species. But the utilization is regulated by Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species dan Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.

Following the aforementioned regulation, distribution of appendix II species must be managed with a controlled extraction from the wild and a set of documentation (Figure 13). The annual national quota is set for each province by the management authority based on recommendation from the scientific authority. Figure 13 shows that those who gather agarwood are required to have a harvest/capture permit. Business actors carrying out domestic and foreign distribution are required to have a distribution permit. Such actors would have several registered gatherers. Since the annual quota is distributed to these workers, permit holders must report their activities to the government. Every transported specimen or product of appendix II species must be accompanied by a domestic transport document (SATS-DN) issued by the provincial unit of Ministry of Forestry (BKSDA), and a cross-border transport (SATS LN) or CITES permit issued by the Directorate General (DG) of Forest Protection and Nature Conservation, or (following nomenclatural changes) DG of Nature Resource and Ecosystem Conservation, in the event of export. Only permit holders who may apply such documentation (Figure 13).

In the case of agarwood from plantation, agarwood harvested from such areas will not be limited by an amount of quota. As long as the specimens are confirmed and verified by the field officer to have originated from that mentioned plantation, they may transport as much as the plantation could produce. However, those plantations must be registered and documented before harvest with sufficient information as regulated in Directorate General of Forest Protection and Nature Conservation Regulation No. P.25/IV-SET/ 2014 on Administration of Agarwood Plantation Registration. Such documentation is deemed exhaustive by the locals, especially those in areas away from the provincial capital, which makes the progress of registration rather slow (Figure 13).

The administration of export requires further verification of other documents, i.e., phytosanitary certificates, export approvals from the Ministry of Trade and export/import notifications from the customs office. The process of document verification could be monitored by a website application called Indonesia National Single Window (INSW). The INSW is a single window service operated by an institution under the Ministry of Finance, to handle related export-import and/or national logistics documents electronically, which includes customs documents, quarantine documents, licensing, port/airport documents, etc. Whenever a documentation fails in the system, the process of permitting will not be continued.

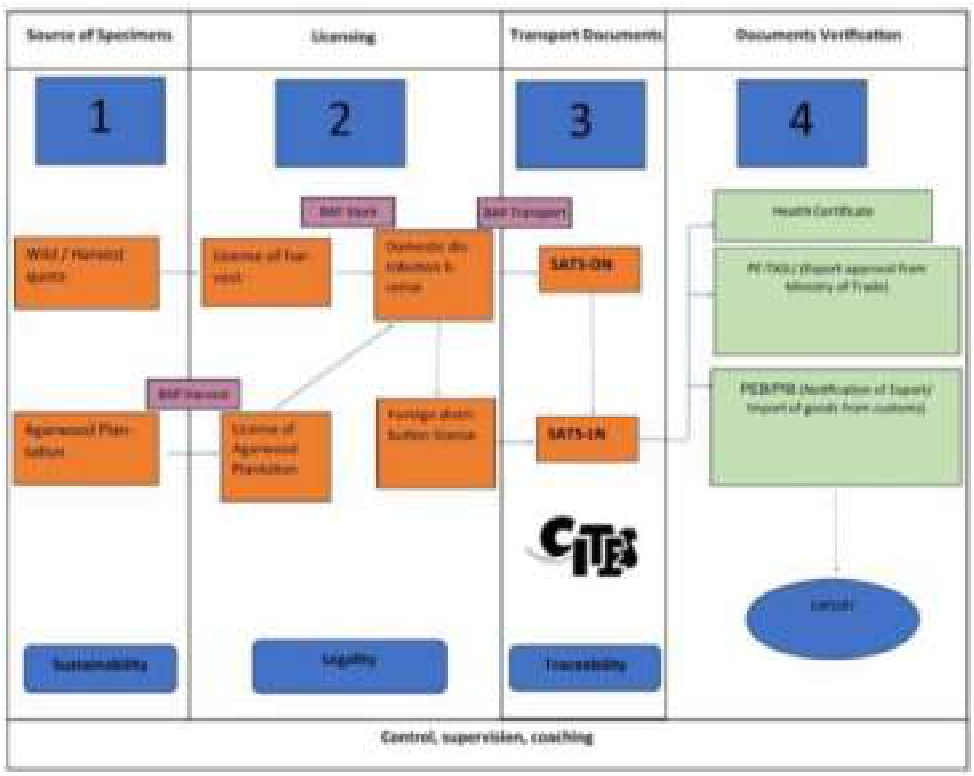

Figure 13. The management procedure under the national regulation.

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Assessment of the trade of specimens with source code "W" for the species *Gyrinops* spp.

I. Non-Detriment Finding Process

The Scientific Authority (SA) establishes teams for evaluating trade of plant species, consisting of personnels from different research centres in the National Research and Innovation Agency (Indonesian: Badan Riset dan Inovasi Nasional-BRIN) and some personnels from the Management Authority (MA) of the Ministry of Environment and Forestry. The team gathers information from various sources, verified their validity at its best, based on scientific principles, and categorized their degree of reliability. Verification is carried out through discussions and visits to points of production, and documentation. Information and results of studies are often obtained sequentially, in accordance with the process and dynamics of trading activities.

The Management Authority (MA) and their field officers are SA's principal teammates in compiling the data, and prepare the assessment and reports. They are maintaining historical records of trade licensing and corresponding activities. Another contributor who also plays the role in acquiring relevant data and information is the trader association. They hold documentation of their members' activities and often facilitate visit to processing sites. Other researchers from BRIN and universities are also involved in field studies on different aspects.

The SA and MA evaluate the imposed annual quota for appendix II species by conducting several meetings and data gathering, starting in the eighth and ninth months of each year. The latest quota and the number of products used were obtained from the records of permit letters that have been granted become the starting point to set the annual quota. Whenever necessary, extra field inspection would be suggested by the SA to the field officers whose results will be reported as additional data/information to be discussed in the final meeting. The evaluation result will become the bases for the quota setting for the following years.

II. Review of the population

Decaying log (*Gyrinops* spp.) is derived from dead wood harvested in the lowland freshwater swamp in Asmat and Mappi Regency in the southern part of Papua Province (Figure 1). The area was once an active forest concession operated during the 80s up to 90s and has been abandoned since then. There are logs of deemed non-valuable wood, sank in the mud which later were found to contain aromatic substances and known by the locals as decaying logs. There was agarwood hunting in Papua in 1995 with low to no-resin content wood were left in the mud (Pers. comm). These sunken-woods then were excavated in 2000 and was considered valuable wood. Since then, extracting decaying logs became the local's main livelihood in Asmat Regency (Soehartono & Newton, 2002) and is still continuing today. Such livelihood is now also found in Mappi Regency. Extraction of these decaying logs is controlled by setting up the annual quota for the last four years.

Alhamd & Rahajoe (2018) reported that the decaying logs are known to originate from Asmat and Mappi Regency. The term "decaying logs" refers to large pieces of logs and roots with a diameter about 50 cm sunken in the swamp area. The swamps are relatively an open area, located in the local's backyard and the areas within a walking distance from the village. The survey was conducted by observing the locals' people when excavating the logs and recording tree species naturally growing around the area.

Figure 1. Extracting decaying log in Asgon, Mappi, Papua

Searching the correct location for decaying log extraction would involve 10-30 persons with an iron hooked-point stick 150-200 cm length. Workers stick the iron into the soft ground repeatedly in the hope that its edge will stumble to the sunken-log (Figure 2). Whenever the search is giving a confidence result, the team will prepare for excavation.

Figure 2. Finding decaying log in the mud: worker with iron stick try to find the decaying log (a-b), iron hook (c), wood flakes which stuck in the hook (d)

The excavation is carried with simple tools, i.e., machetes and long logs, and removed by hand. The depth of excavation is varied, 50-180 cm deep in a soggy swamp (Figure 3). A group of people will hollow the ground at the correct point, which later will turn to be a pool of mud. A volunteer dives into the mud to locate the logs, then the logs will be removed with just man power. Large logs will be cleaned and split into 2-3 parts to allow carriage. They pack the split wood using sagoo (*Metroxylon sagu*) leaves that serve as backpack carriage (Figure 4) and transport them to a point of collection.

Figure 3. Excavation process of decaying log

Figure 4. Transporting decaying log

Based on a record from the Nature Conservation Office in Papua (2017), there are 814,436.86 of swamp in Asmat and Mappi ha (14% from total areas of two regions) that assumed to contain decaying logs, distributed in 22 districts. They reported that 30% communities in Mappi earn their income from the decaying logs (about 8,000 people as decaying hunters and about 350 people operating point of collection). In Asmat there are 45% of communities depend their living from decaying log (11,000 by extracting decaying logs and 531 people operating point of collect) (Pers.comm). This trend is relatively retained until today.

III. Threats

Not applicable. There are no significant threats to decaying logs as it is a non-living material (dead wood). The extraction and excavation activities are not resulted in disturbing the forest as the swamp are located in open areas.

IV. Trade of the specimens

a) Information on the levels of legal trade in the species in the 5 most recent years

Specimens in the trade under the name *Gyrinops* sp. are derived from the sunken-wood known as decaying log. There is no known trade using the term “decaying log” that is taken from living stands. The extraction and distribution of decaying logs is regulated using quota starting in 2020 (see Table 1). With such limitation, it is expected that over-exploitation can be avoided and disturbance to swamp ecosystems would be minimalized. The number of quotas is calculated through estimation of potential areas that contain decaying logs in the two regencies: Asmat and Mappi. A survey in 2018 has shown the possible number of decaying logs per hectare in the area (Alhamd & Rahajoe (2018) and Alhamd et. al. (2019)). The quota set per year is always less than the estimated the total potency, which is around 600-800 tons per year as presented in Table 1.

The decaying logs stacked up at the point of collection and sorted. Most of the volume is transported by cargo ship with correct domestic transport documents (SATS-DN) to Probolinggo, East Java. It requires two to more than four weeks to deliver the logs to the next destination points. A small portion of sorted logs that are considered to have more economic value is sent by air to other cities in Java, e.g., Jakarta or Surabaya. In Java, the wood is processed to extract the resin (Figure 5) or sorted, cleaned and shaped as chips, smaller logs as and additional processed into incense (Figure 6). The quota was started to be imposed in 2020 at an amount of 75 tons (Table 1).

Figure 5. Liquid resin resulted from decaying log.

Figure 6. Decaying logs, unprocessed decaying log (a), decaying log as decorative (b), chips (c,d), varied of incense from decaying log (e,f).

Table 1. Quota and exported in annual permit amount of decaying logs.

Year	Export Quota (kg)	Exported (kg) in Annual report
2017	0	0
2018	0	0
2019	0	0
2020	75,000	75,000
2021	100,000	99,000

b) Levels of illegal.
There is no formal report of illegal trade in decaying logs.

c) Information on procedures for identification of specimens in trade to the species level.

The decaying logs are traded domestically in the form of logs/block, chips, powder and resin. Some logs are milled to form non-exhausted powder and go through a set of processes to produce resin and wasted material known as exhausted powder (Figure 7). Some other logs were sorted, cleaned and shaped to the correct size of chips. The chips are enhanced with the resin through a process known as impregnation. Different customers have their own requirement for the processed products.

The logs before the impregnation process are easily distinguished from other forms of agarwood by its lighter and softer texture. However, to differentiate the logs to species level is very difficult. Research has been carried out in 2018 to identify chips to species level using DNA (Pers.comm). However, the DNA extraction yields low concentration and fragmented DNA. Such conditions only allow the identification to genus level. Therefore, upstream documentations, which are issued by provincial units (BKSDA) in Asmat and Mappi regency, are vital as references to distinguish specimens.

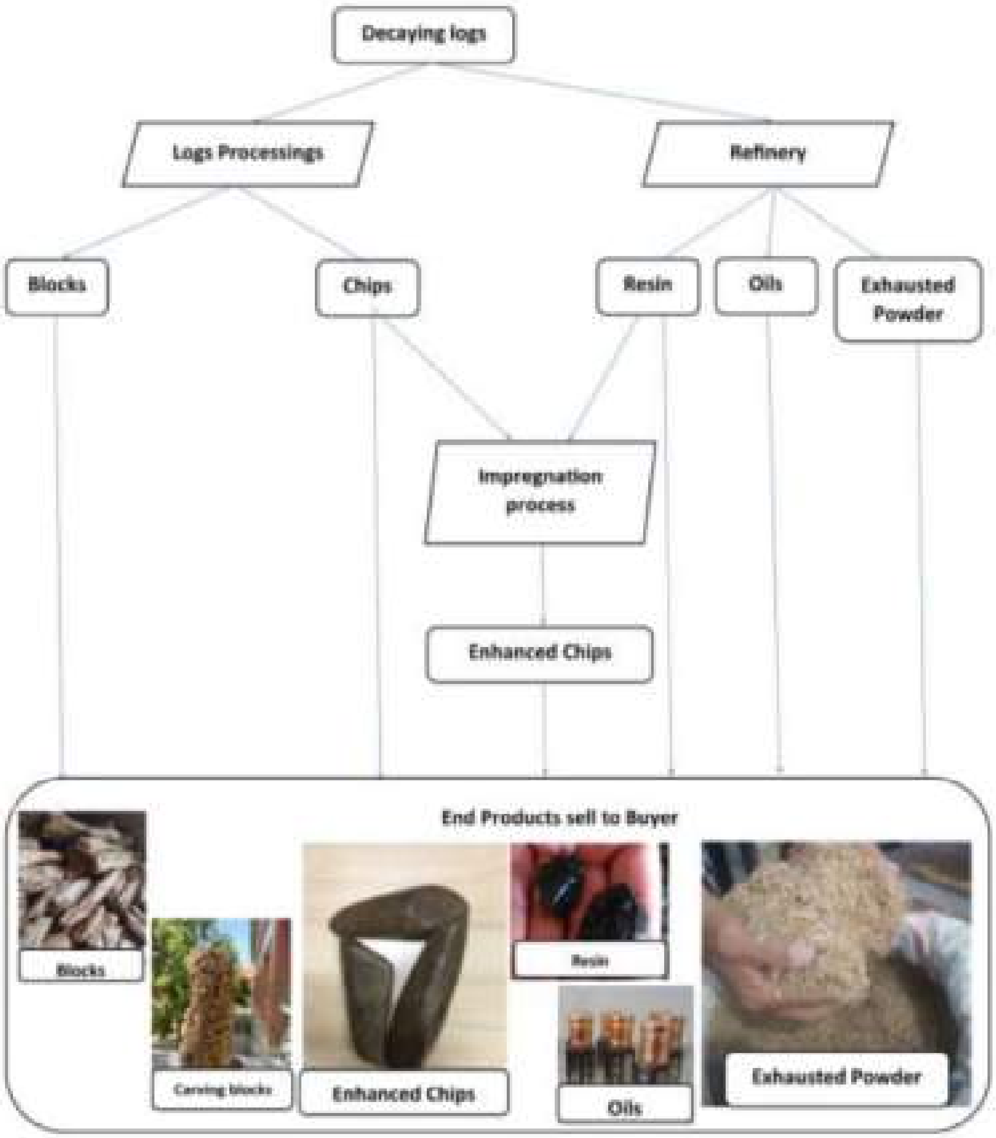

Figure 7. The processing of impregnated woods.

d) Information on any export quota in place for the species and details for 5 most recent years.

The annual quota for decaying logs is published in CITES website. However, there are some nomenclatural discrepancies. For the year 2020, there are three different names used in different documents, while two names were used in 2021 (see Table 2,3 and 4). All names refer to the same specimen, the decaying log from Asmat and Mappi. We found that this was caused by different interpretations by different officers in accommodating a newly regulated specimen. We provide a compiled correct number of annual quotas in Table 1.

Table 2. Total of export Quota of *Gyrinops* spp. (decaying logs)

Year	Export Quota (kg)	Exported (kg) in CITES Trade database	Exported (kg) in Annual report
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	300	300
2021	100,000	54,375	54,875

Table 3. Quota of *Gyrinops decipiens* (decaying logs)

Year	Export Quota (kg)	Exported (kg) in CITES Trade database	Exported (kg) in Annual report
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	75,000	0	0
2021	0	0	0

Table 4. Quota of *Gyrinops versteegii* (decaying logs)

Year	Export Quota (kg)	Exported (kg) in CITES Trade database	Exported (kg) in Annual report
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	73,718	74,700
2021	0	44,125	44,125

e) Information on artificially propagated specimens is distinguished in trade from wild-harvested specimens, if applicable.
Not applicable

V. Species Management

Management of decaying logs exported with source code W is implemented by imposing an annual quota. The quota is set based on estimation of potential yield from the total area of known swamps that contain decaying logs in Mappi and Asmat. The mechanism of setting quota is outlined in Figure 8.

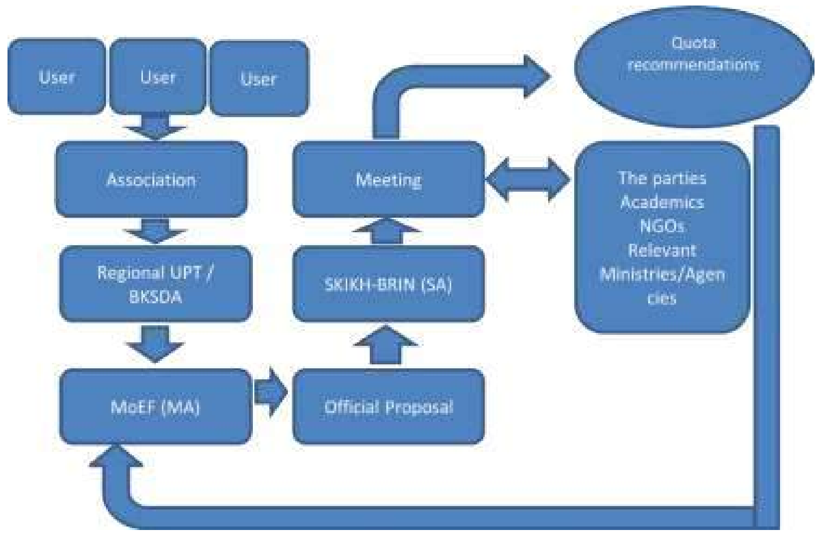

Figure 8. The Proposed harvested quota of wild plant and animal species flowchart

The quota is distributed to domestic permit holders who operate in specific areas. Permit holders employ groups of local people who search and extract decaying logs from the mud. They usually establish a point of collection that also serves as a drying and initial sorting facility in the nearby area. Such facilities and the workers involved are registered and might be inspected by field officers in the provincial unit at any time.

The permit holder is the one who handles the administrative submission for transporting agarwood. Every consignment from the source location to another point of transport and so forth, must be accompanied by an appropriate transport permit (SATS-DN) which states the type and amount of the package, date and locations of transport. This transport permit must be based on minutes of inspection (BAP) issued by authorized officers which verified the actual physical consignment to be transported as declared by permit holders. Both documents must be produced at every point of transport and any changes to the consignment must be declared, which includes the transformation of raw material to products. The product might be in the form of wood chips of varying qualities, oil, powder, decorative carvings and various shapes of incense. A domestic permit holder might also be an export permit holder. An export permit (SATS-LN) or CITES permit can only be granted based on a correct domestic transport permit (SATS-DN) and correct minutes of inspection (BAP). These transport documents also become the tool for local authorities (BKSDA) to monitor the utilization of quota and evaluate performance of a permit holder. The CITES permit became a required document in the export-import single window system established by the government. Regular inspection and monitoring of activities in the point of collection as well as in product processing sites become the main tools in controlling the distribution of decaying logs. The resulting reports determine whether a quota should be lower in the following years, or extraction is temporarily or permanently stopped or re-continued. Please see Figure 9 for the complete procedure.

VI. Law and Regulation

National regulation for utilization of wild plants and animals is mostly contained in the Minister of Environment and Forestry (MoEF) regulation as this ministry is assigned to coordinate CITES implementation and govern Appendix II species management. Those regulations are as follow:

1. Law No. 5/1990 on Conservation of Biotic Natural Resources and Ecosystems
2. Government Regulation No. 7/1999 on the Preserving Plant and Animal Species.
3. Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species.
4. Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.
5. Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals.
6. Directorate General of Forest Protection and Nature Conservation Regulation No. P.25/IV-SET/ 2014 on Administration of Agarwood Plantation Registration
7. Minister of Trade Regulation No.18 Year of 2021 Jo Minister of Trade Regulation 40 Year of 2022 on Export Prohibited Goods and Import Prohibited Goods
8. Minister of Trade Regulation No.19 Year of 2021 Jo Minister of Trade Regulation No.12 Year of 2022 on Export Policy and Regulation
9. Minister of Finance Decree No. 1821/KM.4/2019 on List of Restricted Goods for Export Based on the Minister of Trade Regulation No. 122 of 2018

Based on Government Regulation No. 7/1999 on the Preserving Plant and Animal Species dan Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals stated that agarwood is listed as an unprotected species. But the utilization is regulated by Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species dan Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.

Following the aforementioned regulation, distribution of appendix II species must be managed with a controlled extraction from the wild and a set of documentation (Figure 9). The annual national quota is set for each province by the management authority based on recommendation from the scientific authority. Figure 9 shows that those who gather agarwood are required to have a harvest/capture permit. Business actors carrying out domestic and foreign distribution are required to have a distribution permit. Such actors would have several licensed gatherers. Since the annual quota is distributed to these workers, permit holders must report their activities to the government. Every transported specimen or product of appendix II species must be accompanied by a domestic transport document (SATS-DN) issued by the provincial unit of Ministry of Forestry (BKSDA), and a cross-border transport (SATS LN) or CITES permit issued by the Directorate General (DG) of Forest Protection and Nature Conservation, or (following nomenclatural changes) DG of Nature Resource and Ecosystem Conservation, in the event of export. Only permit holders who may apply such documentation (Figure 9).

In the case of decaying logs, workers (who extract the logs from the mud) operate in a group that is affiliated to a permit holder. This permit holder has a point of collection that also serves as an initial process facility such as sorting and drying. Field officer has the details of such a facility and might inspect the stock and ongoing activities apart from the scheduled verification for transport permission. Permit holders are also required to promote plantations in their operating area with seedling obtained from the nearby standing stock.

The administration of export requires further verification of other documents, i.e., phytosanitary certificates, export approvals from the Ministry of Trade and export/import notifications from the customs office. The process of document verification could be monitored by a website application called Indonesia National Single Window (INSW). The INSW is a single window service operated by an institution under the Ministry of Finance, to handle related export-import and/or national logistics documents electronically, which includes customs documents, quarantine documents, licensing, port/airport documents, etc. Whenever a documentation fails in the system, the process of permitting will not be continued.

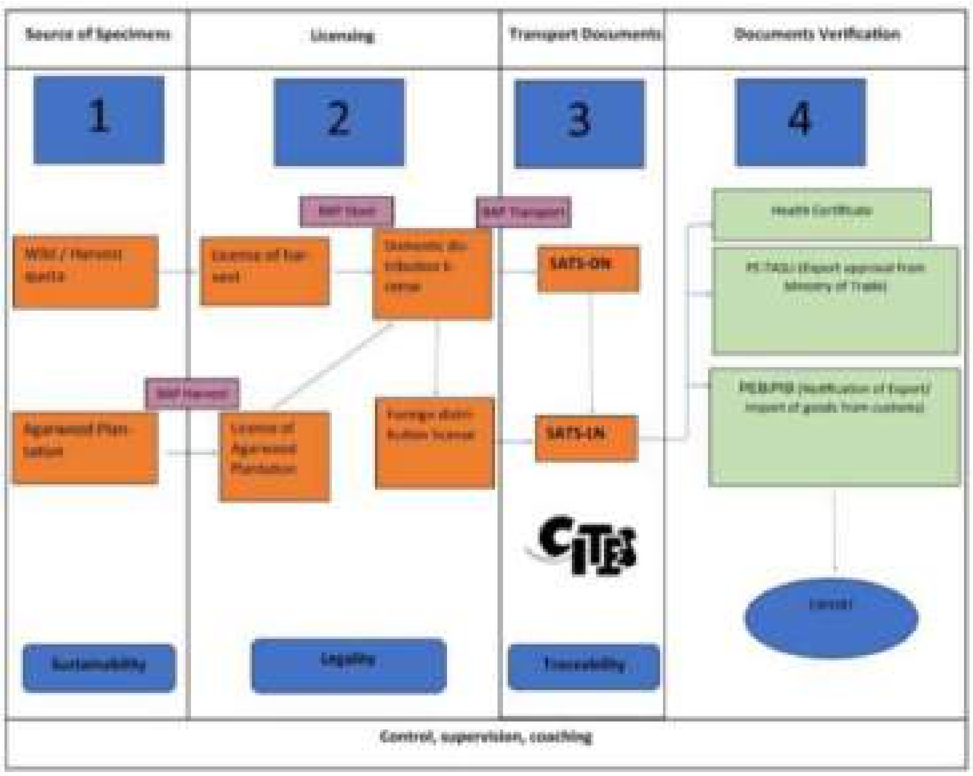

Figure 9. The management procedure under the nasional regulations.

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Indonesia

To UNEP-WCMC

MINISTRY OF ENVIRONMENT AND FORESTRY REPUBLIC OF INDONESIA
DIRECTORATE GENERAL OF NATURAL RESOURCES AND ECOSYSTEM CONSERVATION
DIRECTORATE OF BIODIVERSITY CONSERVATION OF SPECIES AND GENETIC
Manggala Wanabakti Building, Block VII, 7th Floor
Gatot Subroto St., Jakarta 10270 – Telephone/ fax: 62-21- 5720227

1 November 2023

Our Ref: S.782 /KKHSG/PSG1/KSA.2/11/2023

To: **Ms. Ivonne Higuero**
CITES Secretariat
International Environment House
Chemin des Anemones
CH-1219 Chatelaine Geneva
Switzerland
Email: info@cites.org; species@unep-wcmc.org

Subject: Information on Species Subject to the CITES Review of Significant Trade concerning *Aquilaria malaccensis* and *Gyrinops* spp.

Dear Madam,

Referring to your letter Ref: DR/TC/RST/2023 dated 22nd September 2023 regarding Review of Significant Trade in specimens of Appendix-II species [Resolution Conf. 12.8 (Rev. CoP18)] and the letter from UN Environment Programme World Conservation Monitoring Centre dated 5th October 2023 regarding above mentioned, herewith the attachment of response to the request information on *Aquilaria malaccensis* and *Gyrinops* spp..

Thank you for your kind attention and continuous cooperation.

Yours sincerely,

Indra Exploitasia, DVM
Acting Director of Biodiversity Conservation of Species and Genetic
Email: dit.kkh@gmail.com, subditkonvensi.kkh@gmail.com

cc.:
1. Director General of Natural Resources and Ecosystem Conservation, MoEF;
2. Director of Secretariat of Scientific Authority for Biodiversity, NRIA.

Response to request for information on *Aquilaria malaccensis* in Indonesia

1. **Distribution of *Aquilaria malaccensis* in Indonesia, including the extent of occurrence and area of occupancy in the forests, plantations and protected areas**

In Indonesia, the range of native distribution of *A. malaccensis* is in the western part of the country i.e., Sumatra and Kalimantan. However, based on the herbarium specimen, this species also recorded from small islands near Sumatra, i.e., Bangka, Belitung, Karimun and Singkep. Agarwood *A. malaccensis* may be found in the forest (state forest and community forest) or non-forest areas (Figure 1, 2, 3 & 4). At the state forest area, this species grows both in the conservation area (e.i., natural reserve or national parks) and in the production forest. In the past, people hunted agarwood only in the production forest of Kalimantan and Sumatra and spent weeks to months. The resulted gathering is known as wild agarwood.

Wild population of *A.malaccensis* in the western part of Indonesia is assumed to be decreasing as its natural habitat is also decreasing, indicated by the shrinking forest cover, especially in Sumatra and Kalimantan. Currently, most of the agarwood is harvested from areas owned by the community that are adjacent to the forest (Figure 1). Such population is left to grow naturally and harvested when it contains resin with trees that have reached a minimum bole diameter of 20 cm.

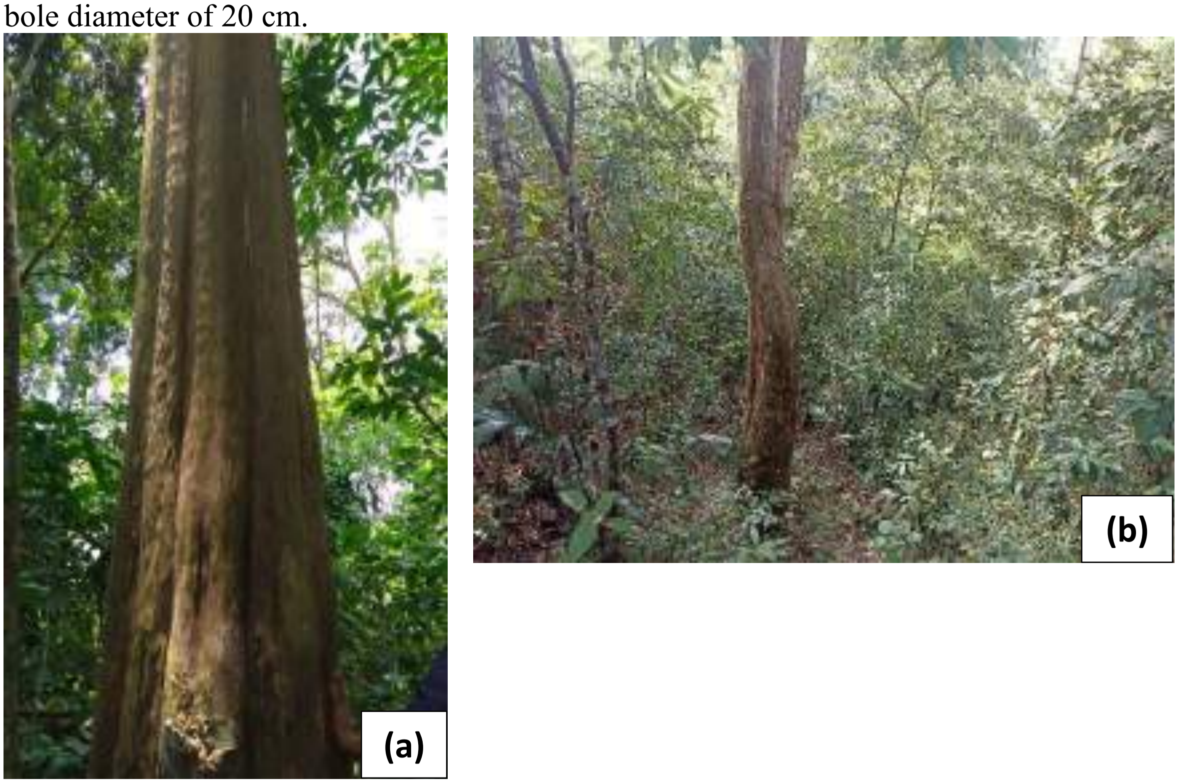

Figure 1. Wild of *A. malaccensis* in community forest, Siak Regency, Riau Province (a), Bengkulu Tengah, Bengkulu Province (b).

Currently, there are sporadic land-use changes. This has caused forested areas for hunting agarwood become lessen. The lands are turned into palm oil or rubber plantations.

However, there are agarwood trees in such plantations that were left to grow naturally and maintained along with the main crop (Figure 2). Trees in these areas receive no special treatment, other than regular nurture and checking. Whenever the main stem of the trees is found to contain resin, the owner of the land would have them harvested.

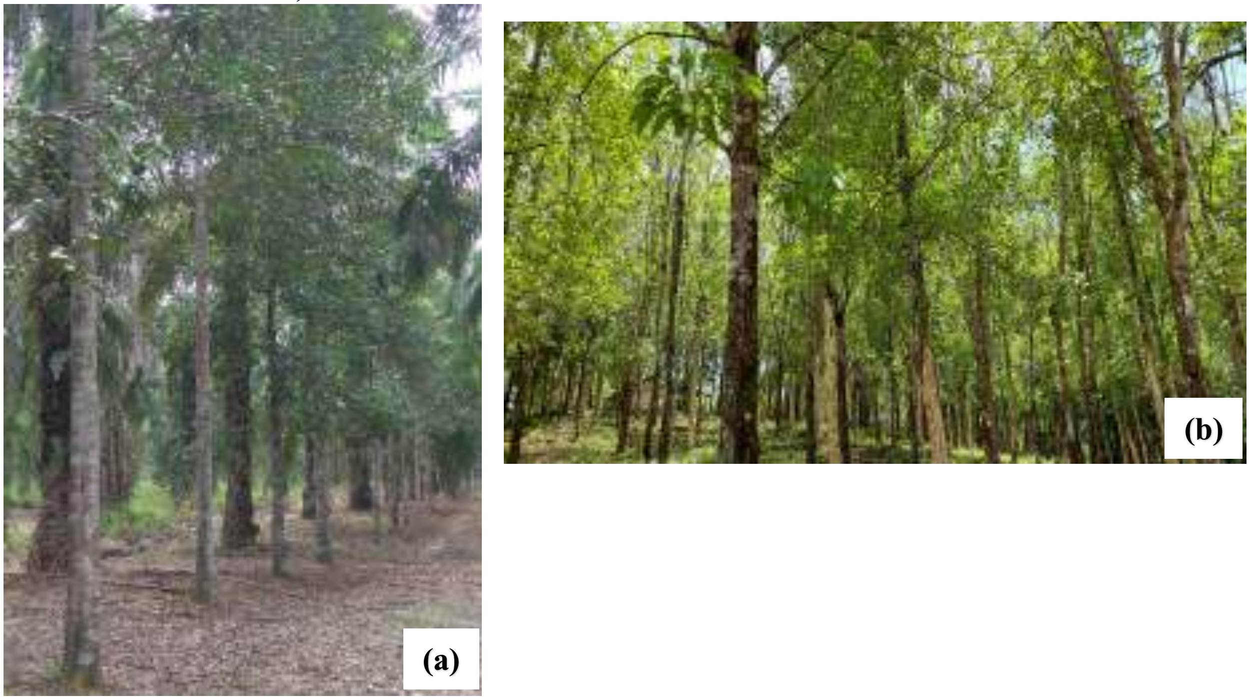

Figure 2. Agarwood “assisted production” (*A. malaccensis*) with palm oil in Bengkalis Regency, Riau Province (a) and agarwood partly “assisted production” and cultivated with rubber in Bengkulu Province (b).

Recently, most of the province in western part of Indonesia have agarwood plantation (Figure 3 & 4). Initially, the agarwood plantation started by the land/forest rehabilitation and reforestation program which used the abundant agarwood *A. malaccensis* seedlings. On the progress, Turjaman & Hidayat (2017) recorded that the agarwood plantation spread out in West Java, Central Java, East Java, Bali, Bangka Belitung, Riau, Aceh, West Sumatera, North Sumatera, West Kalimantan, Central Kalimantan, East Kalimantan, and South Kalimantan.

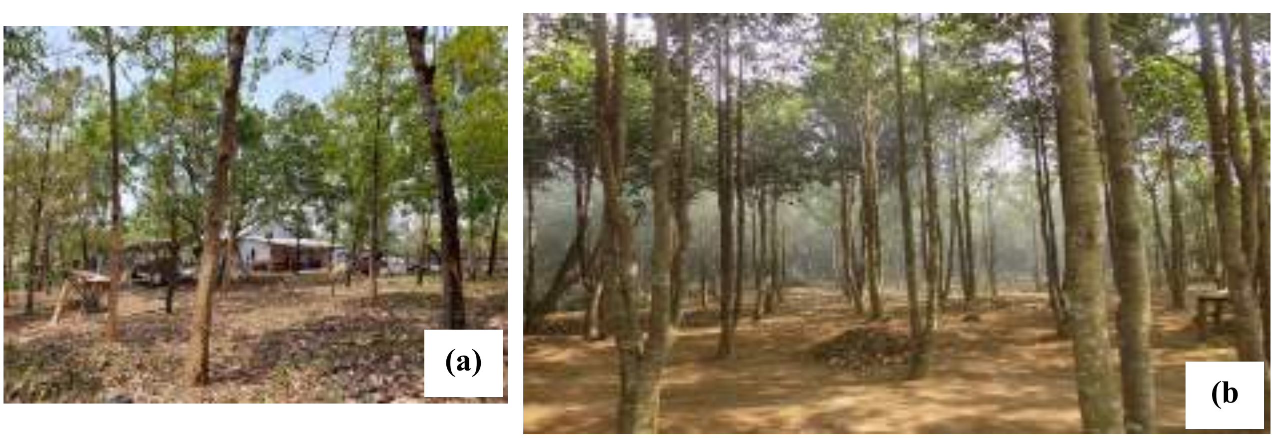

Figure 3. Agarwood *Aquilaria malaccensis* plantation in Bengkulu (a), Trubus Village, Central Bangka Regency, Bangka-Belitung (b) and in Langkat, North Sumatra (c)

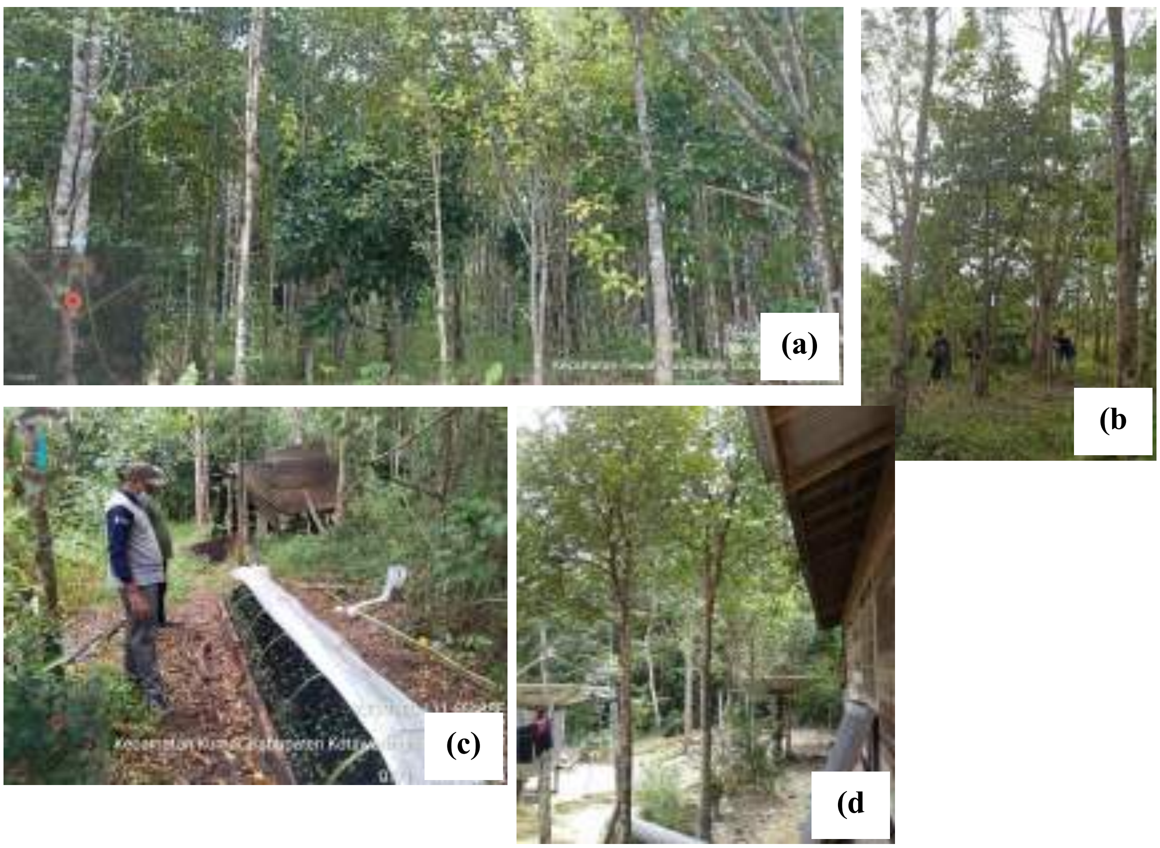

Figure 4. Agarwood *Aquilaria malaccensis* plantation in Central Kalimantan (a) & (b), nursery of agarwood in Central Kalimantan (c), agarwood planted closed to the house (d)

A species distribution model using maximum entropy algorithm found that the suitable habitat for *A. malaccensis* in Indonesia is around 26.45 million ha and moderately suitable around 30.48 million ha (In-prep, 2023). Based on the World Database on Protected Area, there is about 11.17 % of suitable habitat and 12.36 % of moderately suitable habitat that is found in conservation areas. The rest are found in non-conservation areas such as plantations, agriculture, or even in settlements. The suitable areas have *acrisols*, *ferralsols*, *gleysols*, *histosols*, and *nitosols* types of soil. Based on this result, there are sufficiently large suitable areas available for developing new agarwood plantation in the country. Our calculation and mapping distribution of *A. malaccensis* using records from herbarium specimen shows that the Extend of Occurrence (EOO) are about 1,874,073.689 km^2 and Area of Occupancy (AOO) are around 364 km^2 (Figure 5)

Figure 5. The Extend of Occurrence (EOO) and Area of Occupancy (AOO) of *Aquilaria malaccensis*

2. Population size, status and trends of *Aquilaria malaccensis* in Indonesia

Based on researches in the last 15 years, the size of wild population of *A. malaccensis* in several areas in western part of Indonesia is ranged from 0.5 to 10 individuals per hectare. The research was conducted in state forest area, both in conservation area and non-conservation area. A population survey in Berau, East Kalimantan (Abdurrachman, et.al., 2009) showed that there are 29 trees in total area 48 ha or it had density approximately 0.61 ind/ha. The maximum diameter of the *A. malaccensis* tree was 44.7 cm while the minimum diameter was above 10.0 cm. The average of diameter increment was 0.40 cm (± 0.402 cm) per year. Meanwhile, the maximum growth was 0.64 cm per year for diameter class >40 cm. The other survey (Sumarna 2008) in Tabir Ulu District Forest, Merangin Regency, Jambi Province found there were seven trees per unit group of elevation distribution (<100 m, 200 m, >200 m) of *A. malaccenssis* and the population potency of seedling at nature average from each parental tree mean amount to 287 seedling (20.3 m^2 crown canopy). The survey in Rojolelo Forest Park, Bengkulu, Sumatra showed there were 11 trees of A. malaccensis which the diameter is up to 50 cm and 200 seedlings in each parental tree (Partomihardjo et. al, 2010). Furthermore Pribadi (2009) stated that in Kutai National Park there were 37 points of wild *A. malaccensis* in an area of 4,883.75 Ha. The number of mature stands is always less than younger stages, considering that this species needs shades at the seedling stage but requires sufficient sunlight as they grow taller.

Currently, most of the agarwood is harvested from areas owned by the community that are adjacent to the forest. Such population is left to grow naturally and harvested when it contains resin with trees that have reached a minimum bole diameter of 20 cm. In the last 5 years, the “assisted production” population of *A. malaccensis* in Riau was recorded to have population density at most 8.13 individual/ha in Pericit Village and 0.58 individual/ha in Gosib, Siak Indrapura Regency. *A. malaccensis* was found in home gardens and plantations near the village (Yulizah et. al. 2022). People in these village obtain seedling from a mother tree in the nearby forest park. While, Setyawati (2010) reported that *A. malaccensis* stands in Central Lampung and West Lampung were found in cultivation areas where agarwood trees grow naturally on their land. In Bengkulu, Partomihardjo, et al. (2010) wrote there were 20 trees of *A. malaccensis* in farm garden in Bengkulu. A more recent survey (Yulizah et. al 2019), also recorded population densities in Bangka-Belitung region i.e., about 0.14 individuals/ha in Pelangas Village; 4.1 individuals/ha in Lubuk Pabrik Village, and 2.7 individuals/ha in Serdang Village. The “assisted production” agarwood which was found in these villages is associated with palm oil, rubber, pepper and other tree plantations located in production forest areas.

Since the 2000s, there have been some attempts of planting agarwood in Bangka Belitung up to three million stands (Yulizah et. al., 2019). Similar trials also developed in other islands in western part of Indonesia (Figure 3 & 4). Turjaman & Hidayat (2017) mentioned that the total population of planted agarwood in Indonesia is estimated to be about 3.4 million trees. Area with the highest number of estimated populations was Central Kalimantan (0.8 million trees), while the lowest was Jambi (818 trees). Sumatra and Kalimantan Island contribute more than 85% of agarwood plantations in Indonesia (Turjaman & Hidayat, 2017). Based on the registration data recorded by the Management Authority, there are 31 agarwood farmers with the total number of *A.malaccensis* stands was reaching 308,934 trees in a total area 245.94 hectares. It spreads out in Riau, South Sumatra, Bengkulu, Jambi, West Kalimantan and East Kalimantan. Not many owners of planted agarwood have registered their stands since such an administrative process is deemed to be tedious and time consuming. Most people would keep and nurse stands of agarwood that grow in their lands in the hope for future return. A summary of references about agarwood populations in several regions in Indonesia can be seen in Table 1.

Table 1. The Population Size, Habitat and Agarwood Type in Indonesia

No	Location	Density (ind/Ha)	Land Status	CITES Source Code	Reference
1	Tabir Ulu District Forest, Merangin Regency, Jambi Province	7 trees per unit group of elevation distribution (<100 m, 200 m, >200 m) and 287 seedlings around the parental tree	State forest	Wild (W)	Sumarna (2008)
2	STREK (Silviculture Technique for Regeneration of Logged	0.61 ind/ha	State forest	Wild (W)	Abdurachman, et al. (2009)

	Over Area in East Kalimantan) Labanan Research Plot, Berau, East Kalimantan,				
3	Kutai National Park	0,01 ind/ha	State forest (conservation area)	Wild (W)	Pribadi (2009)
4	PLG Bengkulu	10 ind/ha	State forest	Wild (W)	Partomihardjo et. al (2010)
5	Bengkulu Tengah Regency	20 individuals	Farm garden	Assisted production (Y)	Partomihardjo et. al (2010)
6	Tahura (Forest Park) Rojolelo, Bengkulu	11 ind/ha & 200 seedlings in each parental tree	State forest (conservation area)	Wild (W)	Partomihardjo et. al (2010)
7	Way Waya, Sendang Baru Village, Sendang Agung District, Gunung Sugih Regency, Lampung Province	10 ind/ha	Cultivation area	Assisted production (Y)	Setyawati (2010)
8	Mount Maras National Park	0.8 ind/ha	State forest (conservation area)	Wild (W)	Yulizah et.al (2019)
9	Perincit Village, Pusako District, Siak Indrapura Regency, Riau Province	8.13 ind/ha	Home garden	Assisted production (Y)	Yulizah et. al. (2022)
10	Gosib Village, Siak Indrapura Regency, Riau Province	0.58 ind/ha	Home garden	Assisted production (Y)	Yulizah et. al. (2022)
11	Pelangas Village, Simpang Teritip District, Bangka Barat Regency, Bangka-Belitong Province	0.14 ind/ha	Home garden	Assisted production (Y)	Yulizah et.al (2019)
12	Lubuk Pabrik Village, Lubuk Besar District, Bangka Tengah Regency, Bangka-Belitong Province	4.1 ind/ha	Home garden	Assisted production (Y)	Yulizah et.al (2019)

13	Serdang Village, Toboali District, Bangka Selatan Regency, Bangka-Belitong Province	2.7 ind/ha	Home garden	Assisted production (Y)	Yulizah et.al (2019)
14	Tanjung Terdana Village, Pondok Kubang Ditrict, Bengkulu Tengah Regency, Bengkulu Province	100 ind/ha	Private land	Assisted production (Y)	Field inventory (2023)
15	Padang Ulak Tanjung Village, Talang Empat District, Bengkulu Tengah Regency, Bengkulu Province	663 ind/ha	Private land	Plantation A)	Field inventory (2023)
16	Unit 1 Tambak Rejo Village, Padang Jaya District, Bengkulu Utara Regency, Bengkulu Province	1000 ind/ha	Private land	Plantation (A)	Field inventory (2023)
17	West Kotawaringan District, Central Kalimantan	400 ind/5ha	Private land	Plantation (A)	BKSDA (2017)-unpublished data
18	South Barito District, Central Kalimantan	237 ind/23ha, tree with diameter > 20 cm	Private land	Plantation (A)	BKSDA (2017)-unpublished data
19	Gunung Mas District, Central Kalimantan	200 ind with mean diameter 10-20 cm	Private land	Plantation (A)	BKSDA (2023)-unpublished data
20	Gunung Mas District, Central Kalimantan	300 ind/ha consist of: 200 ind with mean diameter 5-10 cm	Private land	Plantation (A)	BKSDA (2023)-unpublished data

		100 ind with mean diameter 15-18 cm			
21	Gunung Mas District, Central Kalimantan	200 ind with mean diameter 10-15 cm	Private land	Plantation (A)	BKSDA (2023)-unpublished data
22	Gunung Mas District, Central Kalimantan	1500 ind/ha with mean diameter 12-22 cm	Private land	Plantation (A)	BKSDA (2023)-unpublished data
23	Bi`ih Village, Karang Intan Subdistrict, Banjar District, South Kalimantan	4000 ind/4.5 ha	Private land	Plantation (A)	BKSDA (2023)-unpublished data
24	Takuti Village, Karang Intan Subdistrict, Mataraman District, South Kalimantan	3000 ind/3 ha	Private land	Plantation (A)	BKSDA (2023)-unpublished data

3. **Threats to these species (and any measures in place to reduce these threats)**

The major threats to *Aquilaria malaccensis* are as follows:

a. There are non-official reports of Illegal harvest from the community that live around the forest area. However, its trends have been declining due to the lower return and higher uncertainties of product availability compared to capital invested. On the other hand, forest rangers are increasing their patrols where the species occurred and monitors product distribution.
b. Lowland forested areas where the species were naturally distributed were converted to mining concessions, palm oil plantations, farms, and settlements.
c. Fungal and pest attacks, (esp *Heortia vitessoides*) were observed in several nurseries which were dedicated for replanting and farming areas. However, studies have shown that certain practices have effectively managed these threats.

These major threats were considerably managed due to great exposure on the species' products. Authorities have been promoting and supporting the species cultivation in various types of land use over the last decade. Local authorities have developed several Forest Management Unit (FMU/KPH) to reinforce agarwood production with mixed planting strategy in palm plantation, community's forest and farms.

4. **Details on how the species are used; is there a domestic as well as international market? If so, what products are traded domestically, and are any data available regarding domestic trade volumes?**

Products of agarwood *A. malaccensis* that are traded across the border, predominantly in the form of chips, some portion of powder, oil, decorative carving and finished products such as incense (Figure 6). The export destination countries are Saudi Arabia, Singapore, Taiwan, United Arab Emirate, Yemen, Kuwait, Republic of Korea, India, Hongkong, Bahrain, Qatar and China. These end products are similar in shape between species. However, the identification to the species level can be trace from the transport documents, particularly for specimens from the wild, registered hunters would be required to describe their finding to their collector/dealer who must include such information in the permit submission. The most workable identification is at the beginning of harvest. Species of standing stock are distinguishable morphologically from their flower, fruit, leaf and wood fiber. Many people in villages plant *A. malaccencis* as this species has the most abundant seedling and is more preferred in the market.

Figure 6. Agarwood products chips (a), non-exhausted powder (b), decorative log (c), oil (d), exhausted powder (e).

There is a small number of agarwood *A. malaccensis* products which domestically marketed in specified community. For example, there are some small shops in Middle East community which provide the agarwood products like powders, oil and derivatives for aromatic essences.

5. **Regulation and management measures in place for wild and/or assisted production/plantation-grown agarwood trade (e.g. legal harvest quotas, export quotas, if trade is managed at species or at genus level), including details of any specific production systems in operation, and/or any registration systems in place for agarwood- producing trees. We would be grateful if you could provide copies of any relevant legislation.**

National regulation for utilization of wild plants and animals is mostly contained in the Minister of Environment and Forestry (MoEF) regulation as this ministry is assigned to coordinate CITES implementation and govern Appendix II species management. Those regulations are as follow:

1. Law No. 5/1990 on Conservation of Biotic Natural Resources and Ecosystems
2. Government Regulation No. 7/1999 on the Preserving Plant and Animal Species.
3. Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species.
4. Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.
5. Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals.
6. Directorate General of Forest Protection and Nature Conservation Regulation No. P.25/IV-SET/ 2014 on Administration of Agarwood Plantation Registration
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8. Minister of Trade Regulation No.19 Year of 2021 Jo Minister of Trade Regulation No.12 Year of 2022 on Export Policy and Regulation
9. Minister of Finance Decree No. 1821/KM.4/2019 on List of Restricted Goods for Export Based on the Minister of Trade Regulation No. 122 of 2018

Species management of *A. malaccensis* exported with source code W is implemented by imposing an annual quota. The quota is set based on available information on population, distribution, level of trade activities per province, indicated by previous years used quota and proposed quota for the following years. The mechanism of setting quota is outlined in Figure 7.

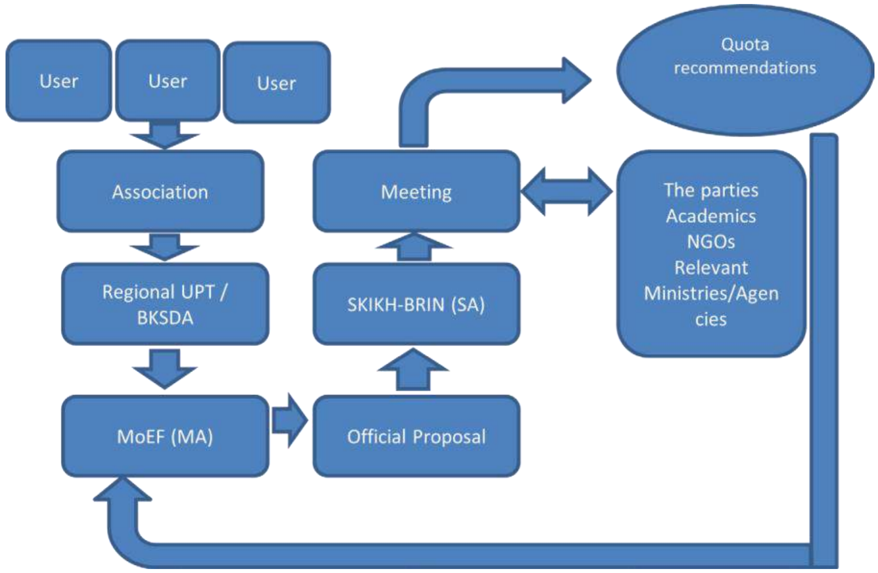

Figure 7. The Proposed harvested Quota of Wild Plant and Animal Species Flowchart

The quota is distributed to domestic permit holders who operate in specific harvest areas. Permit holders usually employ several registered agarwood hunters. These hunters are varied in skill, and can be categorized as forest and non-forest hunter. Those who operate in non-forest areas would differentiate between registered and non-registered plantations.

Based on Government Regulation No. 7/1999 on the Preserving Plant and Animal Species dan Minister of Environment and Forestry Regulation No. P.106/ MENLHK/SETJEN/KUM.1/12/2018 on the Second Amendment to the Minister of Environment and Forestry Regulation No. P.20/ MENLHK/SETJEN/KUM.1/6/2018 on Protected Plants and Animals, agarwood species is not listed as a protected species. However, its utilization is regulated by Government Regulation No. 8/1999 on the Use of Wild Plant and Animal Species dan Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species.

Following the aforementioned regulation, distribution of specimens of Appendix II species must be managed with a controlled extraction from the wild and a set of documentation (Figure 8). The annual national quota is set for each province by the management authority based on recommendation from the scientific authority. Figure 8 shows that those who gather agarwood are required to have a harvest/capture permit. Business actors carrying out domestic and foreign distribution are required to have a distribution permit. Such actors would have several registered gatherers. Since the annual quota is distributed to these workers, permit holders must report their activities to the government. Every transported specimen or product of appendix II species must be accompanied by a domestic transport document (SATS-DN) issued by the provincial unit of Ministry of Forestry (BKSDA), and a cross-border transport (SATS LN) or CITES permit issued by the Directorate General (DG) of Forest Protection and Nature Conservation, or (following nomenclatural changes) DG of Nature Resource and Ecosystem Conservation, in the event of export. Only permit holders who may apply such documentation (Figure 8).

In the case of agarwood from plantation, agarwood harvested from such areas will not be limited by an amount of quota. As long as the specimens are confirmed and verified by the field officer to have originated from that mentioned plantation, they may transport as much as the plantation could produce. However, those plantations must be registered and documented before harvesting, with a set of standard information as regulated in Directorate General of Forest Protection and Nature Conservation Regulation No. P.25/IV-SET/ 2014 on Administration of Agarwood Plantation Registration. Such documentation is deemed exhaustive by the locals, especially those in areas away from the provincial capital, which makes the progress of registration rather slow (Figure 8).

The administration of export requires further verification of other documents, i.e., phytosanitary certificates, export approvals from the Ministry of Trade and export/import notifications from the customs office. The process of document verification could be monitored by a website application called Indonesia National Single Window (INSW). The INSW is a single window service operated by an institution under the Ministry of Finance, to handle related export-import and/or national logistics documents electronically, which includes customs documents, quarantine documents, licensing, port/airport documents, etc. Whenever a documentation fails in the system, the process of permitting will not be continued.

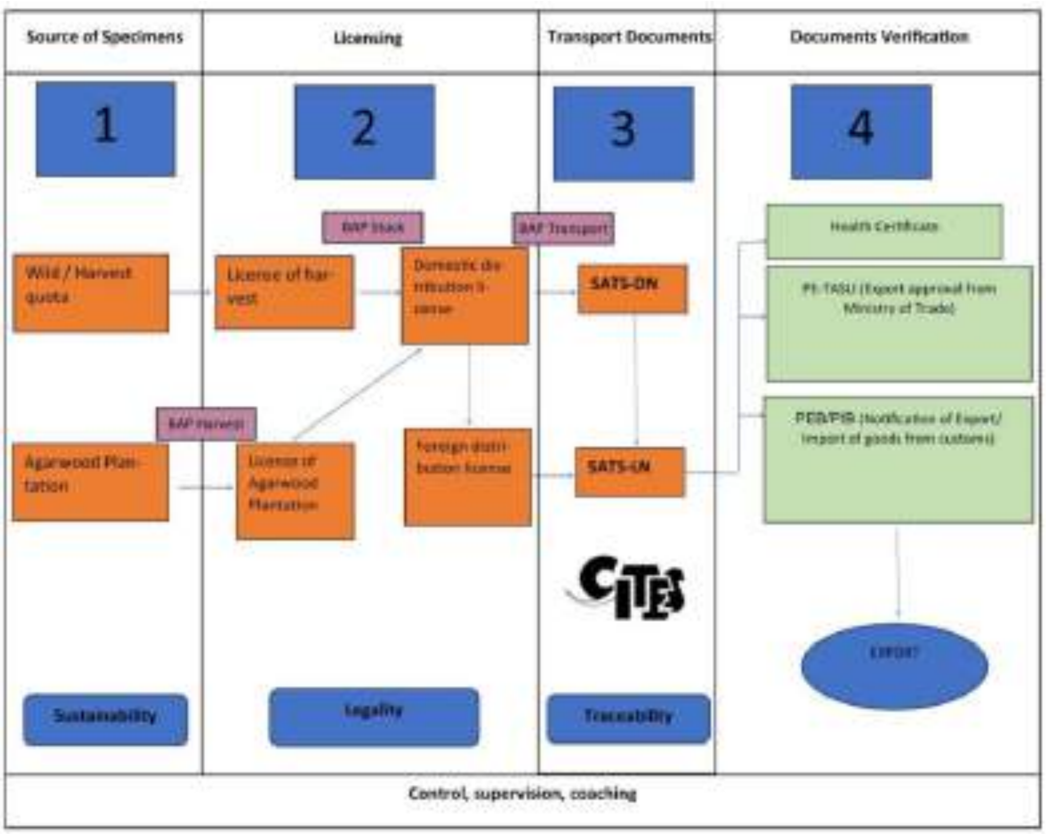

Figure 8. The management procedure under the national regulation.

6. **Population size and structure within harvest locations, including whether any inventories or monitoring of the species has taken/takes place. If so, please provide full details, e.g.: concession, plantation, area, number of individuals inventoried, results of population structure including number of individuals in each diameter size class. If inventories have not taken place, are there any plans to undertake them?**

Harvest quotas for agarwood are set for individual provinces based on available information on standing stock of all types of population, harvest location distribution, permit-holder performance in trading (shown by how their shared quota is taken up) and subsequent proposal. The information is obtained from the local authority (BKSDA) reports and findings, published scientific articles and other field works researches. The data are used to confirm that the agarwood is originate from the non-conservation area and does not threaten the population in the wild.

Quota for *A. malaccensis* in the last five years are set to continuously be lower in the following years, in order to stimulate workers to register standing stock in their plantation or farmland. In addition, Indonesia has a commitment to decrease the quota of wild *A. malaccensis* agarwood in the level of **40%** in 2024. National regulation requires that specimens declared as "non-wild harvest" must be verified and only be taken from registered plantations/farmland. Many people that own planted agarwood, especially those with a small number of trees, hold back to register as they consider the administration is exhausting. Such assumptions lead to alternative distribution of specimens through the established management that is controlled by means of quota. With current productivity, this quota is mostly taken up.

For the agarwood from plantation or "assisted production" area, the farmer makes some physical treatment to the stem i.e., injection, peeling the bark, nailing, etc., and applies chemical substance, or inoculation material composed of Fusarium fungi, or even just agarwood resin from other trees. These treatments are expected to drive the resin formation in the heartwood.

A survey for agarwood harvesting with the "assisted production" and plantation type were conducted recently in Bengkulu, Sumatra. The "assisted production" agarwood measurement was held in Tanjung Terdana Village, Pondok Kubang District, Bengkulu Tengah Regency, Bengkulu Province (Figure 9). The land is owned by CV Usaha Tani Mandiri with total area 1 Ha. There are 100 trees of *A. malaccensis* with diameter range 25.7 – 58.9 cm and height ±15 m. These trees are grown naturally associated with Cempedak (*Artocarpus* sp.), Jambu-jambuan (*Syzygium* sp.) Taping (*Archidendron* sp.). anggrung (*Trema orientalis*), etc. The owner was tried to inoculate the tree by cutting or injuring the agarwood stem in depth of 1 to 3 cm (Figure 9). From the sampling plot sized 400 m^2, there are 6 agarwood trees which the diameter range in 6,5 cm – 58,9 cm. Although they grow in a private land and received non-intensive treatment, the stands and their seedlings are growing well, shown by the existence of smaller trees (Figure 10). For the seedling, it can only be found in small number (4 seedlings in 1 m^2 sampling plot) since the seeds are collected by the farmers as the source of plantation.

Figure 9. The Inoculation Process by Injuring the Stem of *A. malaccensis* in Tanjung Terdana Village, Pondok Kubang Ditrict, Bengkulu Tengah Regency, Bengkulu Province

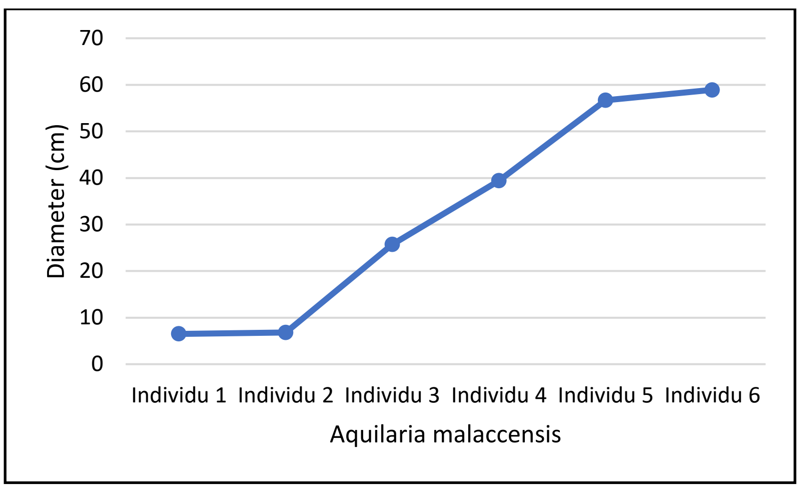

Figure 10. Diameter Class Distribution of "Assisted Production" *A. malaccensis* in 400 m^2 Sampling Plot Area

The agarwood plantation is managed by the farmers which coordinated by a private business for providing the inoculation formula. There are two types of plantations, e.g., mix plantation with rubber and monoculture system. In with the mix planting area, the agarwood trees are planted intermittently with the rubber (Figure 11). The plant spacing of agarwood and rubber is 2.5 m x 3 m that make the density of agarwood stands are about 663 individual/Ha. In the age of 12 years, the agarwood owner would peel the bark and smearing it with inoculation formula to stimulate the resin formation in the stem (Figure 12). The average diameter of agarwood is about 17 cm and eight m height. The peeled stems are left for eight months and harvested afterwards. The bark peeling is repeated following a harvest. With this process, a tree can produce five kg of agarwood in dry weight. During in its life cycle, the agarwood can be peeled 7-8 times. Therefore, the estimation of agarwood production in this area is about 26,520 kg/ha.

Figure 11.The Mix Plantation of Agarwood and Rubber In Padang Ulak Tanjung Village, Talang Empat District, Bengkulu Tengah Regency, Bengkulu Province

Figure 12. Bark Peeling Method of Agarwood Inoculation in Bengkulu Tengah Regency

In Bengkulu Tengah and Bengkulu Utara Regency, it was found a monoculture plant of agarwood (Figure 13). The plant spacing of plantation in Bengkulu Tengah is 4 m x 4 m. In the age of 12 years old, the average diameter are about 18 cm and height 10 m. With the same of bark peeling method, it is estimated that the production of agarwood would reach 25.000 kg/ha. Not all agarwood stands in the monoculture plantations in Bengkulu Utara are inoculated and harvested. The plantations apply different stand spacing, planted seedlings at different ages and gives different treatments. The farmers would prefer their own techniques to achieve acceptable production. Therefore, the diameter class distribution of agarwood in such area is varied (Figure 14).

Figure 13. The Monoculture Agarwood Plantation in Padang Ulak Tanjung Village, Talang Empat District, Bengkulu Tengah Regency(a), Gardu Village, Arma Jaya District, Bengkulu Utara Regency (b) and Unit I Tambak Rejo Village, Padang Jaya District, Bengkulu Utara Regency

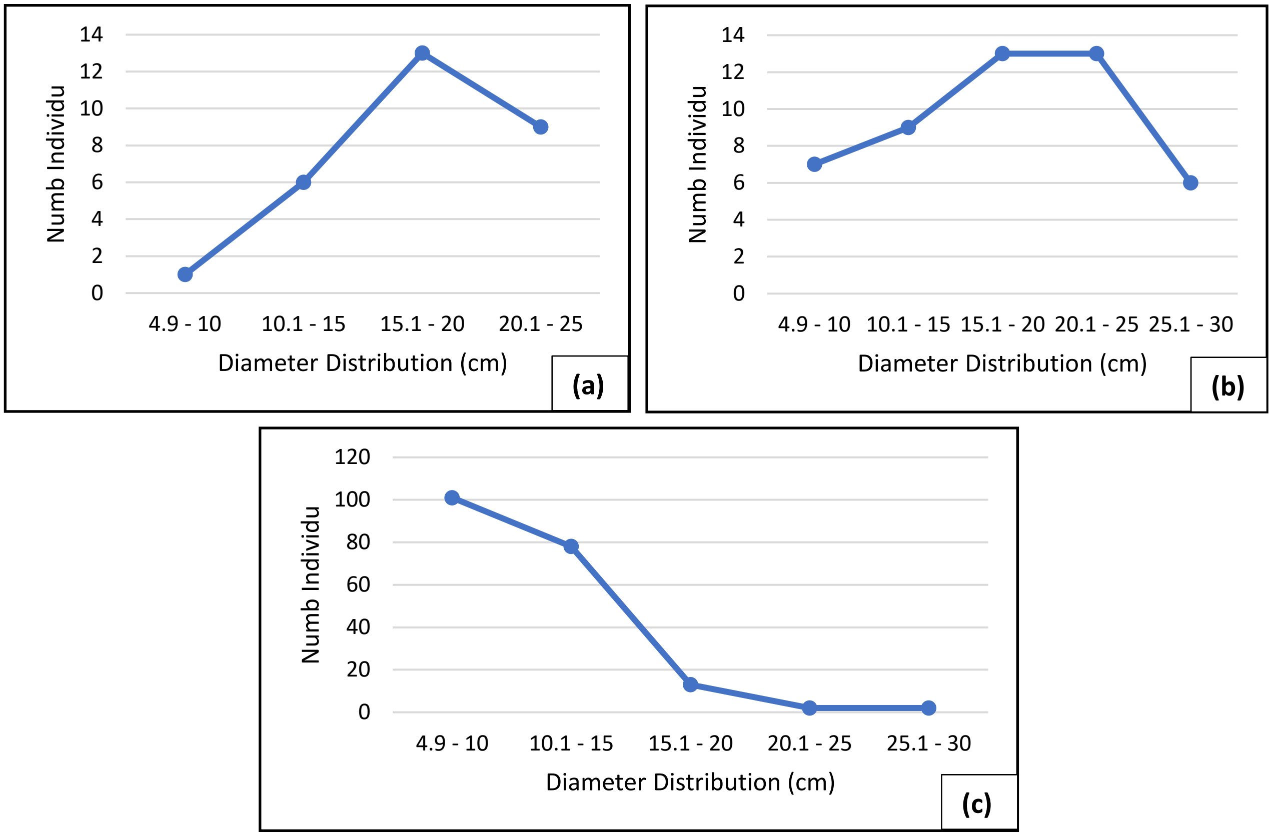

Figure 14. Diameter Class Distribution Agarwood Plantation in 400 m^2: plant spacing 4 m x 4 and age 12 years (a), plant spacing 3 m x 3 m and age 14 years (b), plant spacing 1 m x 1 m and age 15 years (c)

In 2023, the inventory has been established in Gunung Mas District, Central Kalimantan (Tabel 1) (Figure 4). In this area, agarwood was planted mixed with rubber or backyard trees such as jack fruit (*Arthocarpus* spp.), durio (*Durio* sp.), rambutan (*Nephelium lappaceum*) and etc. Furthermore, the inventories in the other locations will be conducted in the following years.

7. **Details of how CITES non-detriment findings are made, including the institutions involved in the process. We would be grateful if you could provide copies of any new or revised non-detriment findings.**

The Scientific Authority (SA) establishes teams for evaluating trade of plant species, consisting of personnels from different research centers in the National Research and Innovation Agency (Indonesian: Badan Riset dan Inovasi Nasional-BRIN) and some personnels from the Management Authority (MA) of the Ministry of Environment and Forestry. The team gathers information from various sources, verified their validity at its best, based on scientific principles, and categorized their degree of reliability. Verification is carried out through discussions and visits to points of production, and documentation. Information and results of studies are often obtained sequentially, in accordance with the process and dynamics of trading activities.

The Management Authority (MA) and their field officers are SA's principal teammates in compiling the data, and prepare the assessment and reports. They are maintaining historical records of trade licensing and corresponding activities. Another contributor who also plays the role in acquiring relevant data and information is the trader association. They hold documentation of their members' activities and often facilitate visit to processing sites. Other researchers from BRIN and universities are also involved in field studies on different aspects.

The SA and MA evaluate the imposed annual quota for appendix II species by conducting several meetings and data gathering, starting in the eighth and ninth months of each year. The latest quota and the number of products used were obtained from the records of permit letters that have been granted become the starting point to set the annual quota. Whenever necessary, extra field inspection would be suggested by the SA to the field officers whose results will be reported as additional data/information to be discussed in the final meeting. The evaluation result will become the bases for the quota setting for the following years.

8. **We also note that Indonesia has published quotas for *A. malaccensis* 2013-2023, please could you confirm whether these quotas apply to the species/genus in general, or whether they were established for specific part(s) or derivative(s) (i.e. chips, powder, oil, logs, timber, etc)?**

Based on the published quota in 2013-2023, it can be explained that it applied to the species of *Aquilaria malaccensis* for all kinds of products.

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Response to request for information on *Gyrinops* spp. in Indonesia

1. **Distribution *Gyrinops* spp. in Indonesia, including extent of occurrence and area of occupancy in forests, plantations and protected areas (for *Gyrinops* spp., please provide species-level information if available)**

   Gyrinops spp. (decaying logs) founds in lowland fresh water swamp and distributed in Asmat and Mappi Regency in the southern part of Papua Province (Figure 1). Based on a record from the Nature Conservation Office in Papua (2017), there are 814,436.86 of swamp in Asmat and Mappi ha (14% from total areas of two regions) that assumed to contain decaying logs, distributed in 22 districts. There is no available information regarding the species as yet, and the species-level identification needs to be resolved.

Figure 1. Distribution of decaying wood (*Gyrinops* spp.)

2. **Population size, status and trends of *Gyrinops* spp. in Indonesia (for *Gyrinops* spp., please provide species-level information if available)**

   Specimens in the trade under the name *Gyrinops* spp. are derived from the sunken-wood known as decaying log. There is no known trade using the term “decaying log” that is taken from living stands. Decaying log (*Gyrinops* spp.) is derived from dead wood harvested in the lowland freshwater swamp in Asmat and Mappi Regency (Figure 2). Alhamd & Rahajoe (2018) reported that the decaying logs currently traded are known to originate from Asmat and Mappi Regency. The term “decaying logs” refers to large pieces of logs and roots with a diameter about 50 cm sunken in the swamp area. The swamps are relatively an open area, located in the local’s backyard and the areas within a walking distance from the village. The survey was conducted by observing the locals' people when excavating the logs and recording tree species naturally growing around the area.

Figure 2. Decaying logs from in Asgon Mappi Regency, Papua.

The area was once an active forest concession operated during the 80s up to 90s and has been abandoned since then. There are logs of deemed non-valuable wood, sank in the mud which later were found to contain aromatic substances and labelled by the locals as decaying logs. There was agarwood hunting in Papua in 1995 that wood with low to no-resin content wood were left in the mud (Pers. comm). These sunken-woods then were excavated in 2000 and was then considered valuable wood. Following the finding, extracting decaying logs became the local’s main livelihood in Asmat Regency (Soehartono & Newton, 2002) and is continuing until today. Such livelihood is now also found in Mappi Regency. Extraction of these decaying logs is controlled by setting up the annual quota for the last four years.

Research has been carried out in 2018 to identify chips to species level using DNA (unpublished data). Due to technical difficulties in obtaining good-quality DNA from the decayed samples, molecular identification can be assigned only to the genus level. Our preliminary results based on trnLF indicated that the wood samples extracted from the mud are similar to *Gyrinops versteegii* or *G. decipiens.* Currently, we continue to work on identifying the wood by adding more samples and applying different techniques. As no correct identification is known yet for the wood, we treat them at the genus level.

3. Threats to these species (and any measures in place to reduce these threats).

There are no significant threats to decaying logs as it is a non-living material (dead wood). The extraction and excavation activities do not resulted in disturbing the forest as the swamps are located in open areas.

4. Details on how the species are used; is there a domestic as well as international market? If so, what products are traded domestically, and are any data available regarding domestic trade volumes?

The decaying logs are traded domestically as logs, chips, powder, and resin. The domestic trade of decaying wood is regulated through harvest quotas. The harvest quota is distributed to domestic permit holders who operate in specific areas. Permit holders employ locals who search and extract decaying logs from the mud. They usually establish a point of collection that also serves as a drying and initial sorting facility in the nearby area. Such facilities and the workers involved are registered and might be inspected by field officers in the provincial unit at any time. The permit holder is the one who handles the administrative submission for transporting agarwood. Every consignment from the source location to another point of transport must be accompanied by an appropriate transport permit (SATS-DN), which states the type and amount of the package, unit, date and locations of transport. This transport permit must be based on minutes of inspection (BAP) issued by authorized officers, which verify the actual physical consignment to be transported as declared by permit holders. Both documents must be produced at every point of transport, and any changes to the consignment must be declared, which includes the transformation of raw materials into products. The product might be wood chips of varying qualities, oil, powder, decorative carvings and various incense shapes. The domestic transport document (SATS-DN) was issued by the provincial unit of the Ministry of Forestry (BKSDA).

Figure 3. The product of decaying wood (*Gyrinops* spp.)

5. Regulation and management measures in place for wild and/or assisted production/plantation-grown agarwood trade (e.g. legal harvest quotas, export quotas, if trade is managed at species or at genus level), including details of any specific production systems in operation, and/or any registration systems in place

for agarwood- producing trees. We would be grateful if you could provide copies of any relevant legislation.

National regulation for the utilization of wild plants and animals is mostly contained in the Minister of Environment and Forestry (MoEF) regulation as this ministry is assigned to coordinate CITES implementation and govern Appendix II species management. Those regulations are as follows:

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9. Minister of Finance Decree No. 1821/KM.4/2019 on List of Restricted Goods for Export Based on the Minister of Trade Regulation No. 122 of 2018

Following the Indonesia regulation (Minister of Forestry Decree No. 447/Kpts-II/2003 on Administration Directive of Harvest or Capture and Distribution of the Specimens of Wild Plant and Animal Species), The annual national (harvest and export) quota is set for each province by the management authority based on recommendation from the scientific authority. The quota is set based on the estimation of potential yield from the total area of known swamps that contain decaying logs in Mappi and Asmat. The mechanism of setting quota is outlined in Figure 4.

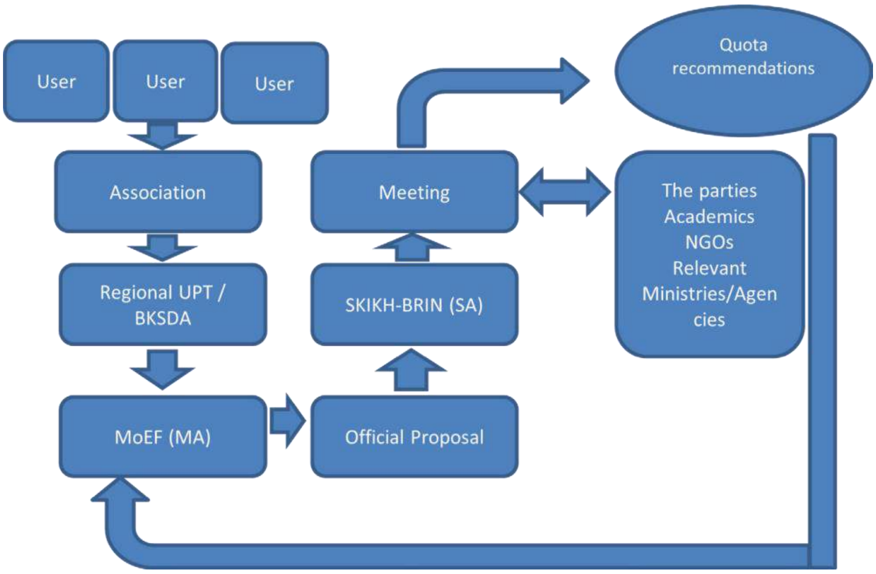

Figure 4. The Proposed harvested quota of wild plant and animal species flowchart

The quota is distributed to domestic permit holders who operate in specific areas. In the case of decaying logs, workers (who extract the logs from the mud) operate in a group that is affiliated to a permit holder. This permit holder has a point of collection that also serves as an initial process facility such as sorting and drying. Field officer has the details of such a facility and might inspect the stock and ongoing activities apart from the scheduled verification for transport permission. Permit holders are also required to promote plantations in their operating area with seedling obtained from the nearby standing stock. Since the annual quota is distributed to these workers, permit holders must report their activities to the government.

The permit holder is the one who handles the administrative submission for transporting agarwood. Every consignment from the source location to another point of transport and so forth, must be accompanied by an appropriate transport permit (SATS-DN) which states the type and amount of the package, date and locations of transport. This transport permit must be based on minutes of inspection (BAP) issued by authorized officers which verified the actual physical consignment to be transported as declared by permit holders. Both documents must be produced at every point of transport and any changes to the consignment must be declared, which includes the transformation of raw material to products. The product might be in the form of wood chips of varying qualities, oil, powder, decorative carvings and various shapes of incense. A domestic permit holder might also be an export permit holder. An export permit (SATS-LN) or CITES permit can only be granted based on a correct domestic transport permit (SATS-DN) and correct minutes of inspection (BAP). These transport documents also become the tool for local authorities (BKSDA) to monitor the utilization of quota and evaluate performance of a permit holder. The CITES permit became a required document in the export-import single window system established by the government. Regular inspection and monitoring of activities in the point of collection as well as in product processing sites become the main tools in controlling the distribution of decaying logs. The resulting reports determine whether a quota should be lower in the following years, or extraction is temporarily or permanently stopped or re-continued. The complete procedure is illustrated in Figure 5.

The administration of export requires further verification of other documents, i.e., phytosanitary certificates, export approvals from the Ministry of Trade and export/import notifications from the customs office. The process of document verification could be monitored by a website application called Indonesia National Single Window (INSW). The INSW is a single window service operated by an institution under the Ministry of Finance, to handle related export-import and/or national logistics documents electronically, which includes customs documents, quarantine documents, licensing, port/airport documents, etc. Whenever a documentation fails in the system, the process of permitting will not be continued.

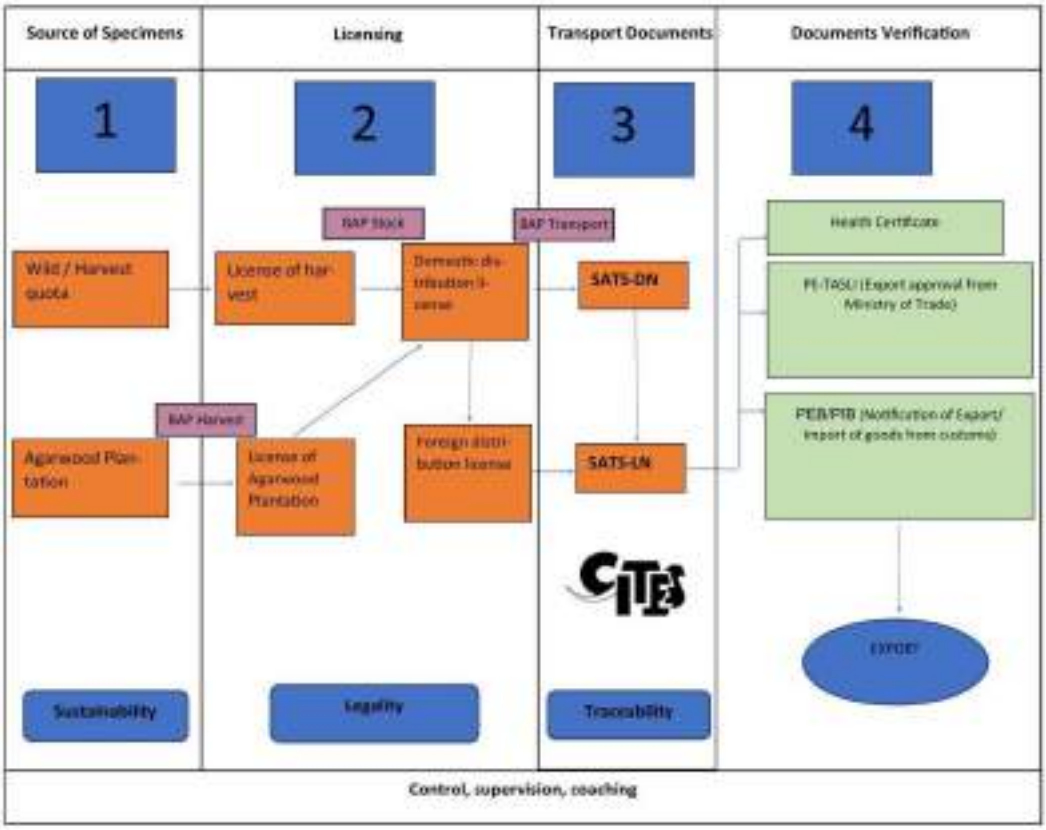

Figure 5. The management procedure under the nasional regulations.

6. **Population size and structure within harvest locations, including whether any inventories or monitoring of the species has taken/takes place. If so, please provide full details, e.g.: concession, plantation, area, number of individuals inventoried, results of population structure including number of individuals in each diameter size class. If inventories have not taken place, are there any plans to undertake them?**

Some surveys had been done in 2018 with 20 observation plots in Mappi and Asmat Regency. The inventories result estimated that there are 119,600 tons decaying wood contained in 230,000 ha area. Currently, another inventory is scheduled by local authorities (BBKSDA Papua) in collaboration with Scientific Authorities.

7. **Details of how CITES non-detriment findings are made, including the institutions involved in the process. We would be grateful if you could provide copies of any new or revised nondetriment findings**

The Scientific Authority (SA) establishes teams for evaluating trade of plant species, consisting of personnels from different research centres in the National Research and Innovation Agency (Indonesian: *Badan Riset dan Inovasi Nasional*-BRIN) and some personnels from the Management Authority (MA) of the Ministry of Environment and Forestry. The team gathers information from various sources, verified their validity at its best, based on scientific principles, and categorized their degree of reliability. Verification is carried out through discussions and visits to points of production, and documentation. Information and results of studies are often obtained sequentially, in accordance with the process and dynamics of trading activities.

The Management Authority (MA) and their field officers are SA's principal teammates in compiling the data, and prepare the assessment and reports. They are maintaining historical records of trade licensing and corresponding activities. Another contributor who also plays the role in acquiring relevant data and information is the trader association. They hold documentation of their members' activities and often facilitate visit to processing sites. Other researchers from BRIN and universities are also involved in field studies on different aspects.

The SA and MA evaluate the imposed annual quota for appendix II species by conducting several meetings and data gathering, starting in the eighth and ninth months of each year. The latest quota and the number of products used were obtained from the records of permit letters that have been granted become the starting point to set the annual quota. Whenever necessary, extra field inspection would be suggested by the SA to the field officers whose results will be reported as additional data/information to be discussed in the final meeting. The evaluation result will become the bases for the quota setting for the following years.

8. **We also note that Indonesia has published quotas *Gyrinops* spp. for 2013-2016 (agarwood) and 2021-2023; please could you confirm whether these quotas apply to the species/genus in general, or whether they were established for specific part(s) or derivative(s) (i.e. chips, powder, oil, logs, timber, etc).**

As mention previously, specimens in the trade under the name Gyrinops spp. are derived from the sunken-wood known as decaying log. Based on this information, the quota for decaying logs were apply at the genus level.

Input for CITES

CITES PC26 Review of Significant Trade: Exports of *Aquilaria malaccensis* and *A. crassna* from Malaysia

No.	Issue	Malaysia' s Feedback to CITES
1	Whether Malaysia is a range State of *A. crassna*	Malaysia is **not** a range state of *A. crassna*. However, Malaysia has forest plantations that carries this species.
2	The source codes of exports in *A. malaccensis* and *A. crassna* from Malaysia	*Aquilaria malaccensis*: Wild harvested (W) only in Peninsular Malaysia region and Artificially propagated (A) from **Peninsular Malaysia and Sarawak regions. Sabah has no trade for Aquilaria spp.** *Aquilaria crassna*: Artificially propagated (A) since Malaysia is not a range state.
3	The scientific basis by which Malaysia established that exports of *A. malaccensis* and *A. crassna* are not detrimental to the survival of the species concerned and are compliant with Article IV of CITES	1. Population of *A. malaccensis* in the wild is determined in accordance with the findings of the **Fourth National Forest Inventory** (NFI-4) published in 2014. The export quota for year 2015 onwards is then calculated based on the standing stock (diameter > 30cm; excluding protected forest) and cutting cycle of 50 years. Only an approximate of 10% of the agarwood tree population contain the *gaharu* resin. **Using the more conventional and 'Cautious Harvest Quota Determination' since 2008, Department of Forestry Peninsular Malaysia, has used these fundamentals for the scientific methodologies of NFI-4 and NFI-5. The findings of both these inventories has shaped the policies taken by Malaysia. Based on the latest inventory (NFI-5), the proposed quota for year 2024 is 5,000 kg.** Source: Fourth National Forest Inventory (Peninsular Malaysia) and Fifth National Forest Inventory (Peninsular Malaysia)

		2. The government has decided to reduce the pressure on the wild agarwood based on the 2 inventories undertaken (NFI 4 and NFI-5) since 2014. Because *A. malaccensis* is more common and abundant than the other agarwood species, Malaysia have domestically taken a measure to control the trade of Aquilaria spp. (including *A. malaccensis)*. **The last removal pass was given in 2014,** which means **no harvesting of *Aquilaria spp*. from the wild from the forest reserves has been allowed since 2015. In 2021, the Government has undertaken a stricter measure through a national policy to move towards a zero quota for agarwood or the *Aquilaria spp*. for Malaysia.** The trade that is happening now is from the previous stockpile that received removal passes before 2015. In line with the policy, since 2021, the local industry had been consulted via dialogues about quota reduction and has continuously been in achieving zero export quota in the near future. 3. Malaysia has been actively revising our quota and has been reducing our annual export quota, and **targeting to move towards zero export quota from the wild in a few years to come**. Recognizing the need to stabilize the wild population of *A. malaccencis*, the export quota has been decreased gradually since year 2021 as follows: 2009 to 2013 - 2013 – 200,000 kg (*A. malaccensis.*) 2021 – 150,000 kg (*Aquilaria spp.*) 2022 – 50,000 kg (*Aquilaria spp.)* 2023 – 25,000 kg (*Aquilaria spp.*) (*Reference: Malaysia's quota listing*) 4. Furthermore, in 2016, a 'Conservation Action Plan for the Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia' was established under ITTO-CITES project to enhance the effectiveness of Malaysia conservation effort for the species. 5. Two *A. malaccensis* arboretum were established in two states: i.e. Pahang and Selangor through CITES Tree Species Programee as *ex situ* conservation approach to preserve the genetic diversity of

the species. This arboretum could also act as seed source for plantation industry and lessen the pressure for wild harvesting.

Other references:

(i) Chua, L.S.L. (2008). Agarwood (*Aquilaria malaccensis*) in Malaysia. Case study prepared for The International Expert Workshop on CITES Non Detriment Findings. Mexico, 17 – 22 November 2008 (**Appendix 1**)

(ii) Chua, L.S.L., Lee, S.L., Lau, K.H., Nurul-Farhanah, Z., Tnah, L.H., Lee, C.T., Ng, C.H. & Ng, K.K.S. 2016. Conservation action plan for the threatened agarwood species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia. Forest Research Institute Malaysia, Kepong, p.74 (**Appendix 2**)

(iii) Lau, K.H., Chua, L.S.L. & Muhammad Alif, A.A. 2022. Outreach Action Plan of the *Aquilaria malaccensis* Arboretum 2022-2031: An Early Concept. Forest Research Institute Malaysia, Kepong. (**Appendix 3**)

Additional Information:

6. In addition, 3 projects were conducted by the Forest Research Institute Malaysia (FRIM) from 2011-2022 that researched on the phenology, reproductive ecology and population genetics of *Aquilaria m.* Some populations remained to be monitored for phenological activities until today. Data on tagged trees and their localities from forest reserves in Peninsular Malaysia were deposited into Sistem FloraC, a CITES-listed tree species management system developed by Forestry Department Peninsular Malaysia (FDPM).

7. In terms of legal protection, other that the domestic CITES law and the Forestry Act at in Peninsular Malaysia, at the same time, in the region of Sarawak, there is an additional legal protection that is given to agarwood through the Wildlife Protection Ordinance 1998, Sarawak Biodiversity Centre Ordinance 1997, National Parks & Nature Reserves Ordinance 1997, Forest Ordinance 2015.

AGARWOOD (AQUILARIA MALACCENSIS) IN MALAYSIA

Lillian Swee Lian Chua
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AGARWOOD (*AQUILARIA MALACCENSIS*) IN MALAYSIA

AUTHOR:

Lillian Swee Lian Chua

Forest Research Institute Malaysia (FRIM). This document is prepared only for Aquilaria malaccensis found in Malaysia. Little information is available for other agarwood-producing species in Peninsular Malaysia, Sabah and Sarawak. Apart from the geographical distribution, no stocking, harvest and trade data are available.

I. Background information on the taxa

1. BIOLOGICAL DATA

1.1 Scientific and common names

Aquilaria malaccensis Lam. (Thymelaeaceae). Common names: agarwood, aloeswood, eaglewood. Vernacular names: gaharu, karas (Indonesia and Malaysia). Twelve other native species, belonging to the genera *Aetoxylon, Aquilaria, Gonystylus* and *Wikstroemia* (all Thymelaeaceae), are thought to produce agarwood (Appendix 1). In Sarawak, it is *Aetoxylon sympetalum* that produces the 'true *gaharu* wood' (Anderson 1980).

1.2 Distribution

The phytogeographical region for *Aquilaria malaccensis* comprises India, Myanmar, Sumatra, Peninsular Malaysia, Singapore, Borneo and the Philippines. Its geographical distribution in Peninsular Malaysia is given in Fig. 1. Although the species is widespread, it occurs at low density.

Aquilaria malaccensis is absent from Sarawak while other species of this genus are reported to be generally rare (Tawan 2004). *Aetoxylon sympetalum*, a species that is a source of gaharu, was noted as being locally frequent in the heath forests in west Sarawak (Anderson 1980) and fairly common throughout the State (Tawan 2004). *Aetoxylon sympetalum* is absent from Sabah.

1.3 Biological characteristics

1.3.1 *General biological and life history characteristics of agarwood*

Aquilaria malaccensis produces seeds after 7–9 years while some other species produce seeds only once in their life cycle. Seed viability is approximately 1 week and germination takes place between 16–63 days (Ng 1992). Germination is epigeal and of the hypogeal type. Not all mature trees produce the gaharu resin. Germination rates may reach 90% for mature fruits that are sown immediately (Chang, pers. comm.). Trial planting on the grounds of the Forest Research Institute Malaysia have shown that survival of tissue-cultured plantlets 24 months after planting was 66.3% while that of seedlings was 40.3%. The initial and final plantlet heights were 43.1 and 136.6 cm, respectively, while those for the seedlings were 27.9 and 114.8 cm, respectively (Lok et al. 1999). A 0.9-ha research plot planted with 833 trees ha^{-1} in 1928 had a density of 31 trees ha^{-1} in 1995. The mean diameter at breast height (dbh) of the stand was 38.2 cm with a mean height of 26.7 m and a mean clear bole height of 15.7 m (Lok & A. Zuhaidi 1996).

The Third National Forest Inventory (NFI-3) conducted between 1991 and 1993 for Peninsular Malaysia showed that *Aquilaria* spp. occurred in both logged and primary forests (Chin *et al*. 1997). In the 'Best Virgin Forest' category, there were 1.79 stems per hectare in size classes above 10 cm dbh (Chin et al. 1997).

The Fourth National Forest Inventory (NFI-4), conducted between 2002 and 2004 for Peninsular Malaysia, provides the *Aquilaria* spp. stocking in the virgin, logged-over and stateland forests (Table 1; Anon. 2006a). It estimated 0.62 stem ha^{-1} for size classes >10 cm dbh for all *Aquilaria* spp. These stems have an estimated timber volume of 0.311 m3 ha-1. Trees 10?14.9 cm dbh made up 48% of the total stem number while trees 15?44.9 cm dbh provided 67% of the total volume (Anon. 2008). The state of Pahang has the highest volume of *Aquilaria* while Kelantan has the highest number of stems (Mohd Paiz 2006). The above estimates are for stem number and timber volume of all Aquilaria species, noting that not all stems produce the *gaharu* resin.

Results from a long-term, large-scale demographic study indicate a poor stocking of seedlings through natural regeneration in a primary forest. In the Pasoh 50-ha tree demographic plot, at least 125 trees above 1 cm dbh were recorded in 1985 (Manokaran *et al*. 1992). The individuals were distributed evenly throughout the plot with no indication of spatial patterning (Fig. 2), occurring on wet ground, hill slopes, on sand and clay (LaFrankie 1994). 53.6% of trees had diameters <5 cm with the largest tree 41.3 cm dbh. The density of trees >10 cm dbh was slightly less than one tree per hectare and assuming a reproductive size of approximately 10 cm dbh, the juvenile to adult ratio was only 1.5. Based on a median inter-census period of 2.81 years, LaFrankie (1994) worked out the recruitment rate to be 1.42 trees year^{-1} for the entire 50-ha plot. Growth rates ranged from 0 to 1.95 cm year^{-1}. The distribution of growth rates was strongly skewed with a mean value of 0.33 cm year-1 and a median value of 0.22 cm year^{-1}.

Table 1. Stocking of *Aquilaria* spp. in the virgin, logged-over and stateland forests in Peninsular Malaysia between 2002?2004 according to dbh class.

State	DBH class 15-30 cm		DBH class 30-45 cm		DBH class >45 cm		Total	
	No. stem/ha	Volume (m^3/ha)	No. stem/ha	Volume (m^3/ha)	No. stem/ha	Volume (m3/ha)	No. stem/ha	Volume (m3/ha)
Johor	-	-	29,920	37,281	14,673	59,424	44,593	96,705
Kedah	83,869	26,502	16,282	20,624	10,855	22,795	111,006	69,921
Kelantan	1,413,067	181,084	-	-	-	-	1,413,067	181,084
Melaka	2,037	1,513	-	-	218	1,002	2,255	2,515
Negeri Sembilan	4,464	496	-	-	8,846	19,857	13,310	20,353
Pahang	570,169	310,030	377,034	392,636	25,261	101,045	972,464	803,711
Penang	5,674	2,459	-	-	-	-	5,674	2,459
Perak	106,919	60,602	160,457	149,194	41,568	60,966	310,944	270,762
Terengganu	122,873	23,566	18,853	15,711	50,437	342,650	192,163	381,927
Total	2,309,072	606,252	602,546	615,446	151,858	607,739	3,065,476	1,829,437

Source: Anon 2006a

Lee *et al*. (2002) reported approximately 278 stems of *Aquilaria beccariana* (>1 cm dbh) from a 52-ha long-term ecological research plot in Lambir Hills National Park (Fig. 3). However, Dawend et al. (2005) reported that most of the trees in this plot had been wounded by collectors and were felt to be too small to sustain the population. As for Sabah, there has been no recent study on agarwood-producing species.

1.3.2. *Habitat types*

Aquilaria malaccensis is widespread in the lowland dipterocarp and mixed dipterocarp forests at altitudes up to 270 m while *Aetoxylon sympetalum* occurs in the lowland mixed dipterocarp forest and heath forest at altitudes up to 100 m.

1.3.3 *Role of the species in its ecosystem*

The role of the species in its ecosystem is unknown.

1.4 Population

1.4.1 *Global Population size*

The Malaysian data is insufficient to extrapolate the global population size of the species since little is known about the regeneration pattern and size class distribution within the larger extent of its range.

1.4.2 *Current global population trends*

The population is decreasing. Many studies have reported a reduction in natural populations in Peninsular Malaysia (Mah *et al*. 1983, Giano 1986), Sarawak (Chin 1985, Dawend *et al*. 2005, Brookfield *et al*. 1995) and Sabah (Judeth *et al*. 2000, Henrik 2001, Anon. 2005b).

1.5 Conservation status

1.5.1 *Global conservation status* (according to IUCN Red List)

VU A1cd (ver 2.3)

1.5.2 *National conservation status for Malaysia*

VU A4c (2007)

1.5.3 *Main threats within Malaysia*

Unsustainable harvest, habitat loss/degradation (human induced).

2 SPECIES MANAGEMENT IN MALAYSIA

2.1 Management measures

2.1.1 *Management history*

Harvesting in the Malaysian production forests follows the Selective Management System (SMS). All production forests of the Permanent Reserved Forests (PRFs) in Peninsular Malaysia are managed through the SMS. This system is currently intertwined with the Malaysian Criteria and Indicators for Forest Management Certification, a market-linked tool to promote and encourage sustainable forest management as well as to provide an assurance to buyers that the timber products they purchase come from sustainably managed forests. Prior to the SMS, Malaysia had practised the Malayan Uniform System, whereby the mature stand in a primary forest was cleared in a single commercial felling followed immediately by systematic silviculture treatments to release natural regeneration obtained from advanced growth (Wyatt-Smith 1995).

There was no specific management plan for agarwood-producing species under the SMS. Agarwood is treated as a minor forest product.

Global demand prior to 1975 was specific to niche markets and harvesting was done selectively. Harvesting only became unsustainable when the price of *gaharu* escalated.

No harvesting is permitted in areas gazetted as Totally Protected.

2.1.2 *Purpose of the management plan in place*

The SMS was formulated in 1978 to recognize the importance of a balance between sustainability of harvesting with long-term conservation. It was also designed to achieve sustainability of harvest with minimum development costs and optimise harvesting under prevailing conditions.

2.1.3 *General elements of the management plan*

Since agarwood is treated as a minor forest product, harvesting of the species is not subjected to the restrictions imposed in the SMS, i.e., there is no cutting cycle and the minimum diameter limit of 45 cm is not observed.

A Standard of Procedures was developed in 2005 to control and monitor harvesting, processing and trade activities (Anon. 2005a). With regards to the harvest license, a deposit of MYR10,000 (approx. US $3,125) is imposed on each license approved. Trees <20 cm diameter and trees in flower and fruit are not allowed to be harvested. The harvest quota is set at 500 kg of wood chips per month per license and a royalty rate of 10% *ad valorem* per kg (depending on the grade) is charged on the amount of gaharu taken. Any person who contravenes any terms and conditions stipulated in the license is liable to be blacklisted or subjected to the cancellation of the license. In addition, the licensee is required to supply 3,000 seedlings per annum to the State Forestry Department and to submit a monthly shuttle return. With regards to licensing for the purpose of processing and trade, manufacturers and traders must have a valid license, are required to maintain a log book indicating the amount of *gaharu* processed and traded, and to submit monthly shuttle returns. Where export is concerned, a CITES permit is required. The exporter is also required to register with the Malaysian Timber Industry Board (MTIB).

2.1.4 *Restoration or alleviation measures*

Trial planting of *Aquilaria malaccensis*, as part of both government and private sector initiatives, is being conducted in Peninsular Malaysia, Sabah and Sarawak (Mohd Paiz 2006, Dawend *et al*. 2005, D. Alloysius, Yayasan Sabah, pers. comm.). Research attempts are being carried out on inoculation, chemical analysis of the resin, growth performance under plantation conditions, and large-scale planting in

Malaysia. Experimental planting of this species has not yet expanded to commercial scale because of several reasons. Not all inoculated trees develop the resin which indicates a significant degree of phenotypic variation with regards to disease resistance in natural populations. Genotypes differ in their behaviour as host when attacked by pathogens. Different genotypes of the same pathogenic species may be successful to different degrees as parasites on different host genotypes. Certain strains or land races may be more sensitive or responsive to fungal attack than others. Other factors that limit large-scale planting are the scarcity of planting materials and low seed viability. Research efforts are currently underway to mass-propagate plantlets containing desired traits.

2.2 Monitoring system

2.2.1 *Methods used to monitor harvest*

As mentioned in section 2.1.3.

2.2.2 *Confidence in the use of monitoring*

As will be seen in section 3.3., the regulation of harvest, processing and trade through licenses requires improvement. There are inherent difficulties in attempting to regulate harvesting activities undertaken by indigenous communities and foreign collectors. In view of the lucrative nature of the trade, Nicholas (2000) and Lim *et al*. (in. prep.) observed that personnel from enforcement agencies have also been engaged in the trading of agarwood.

2.3 Legal framework and law enforcement

Malaysia has general laws that include the governing of agarwood collection (protection of flora), cultivation, processing and manufacture, domestic and international trade. The laws for the protection of agarwood-producing species include two aspects, i.e., the establishment of protected areas and the regulation of harvest. Laws that address both of these aspects include the *National Forestry Act 1984* (amended 1993), *Sarawak Forests Ordinance 1958* (amended 1999), *Sabah Forest Enactment 1968* (amended 1992), *Protection of Wildlife Act 1972*, *Sabah Wildlife Conservation Enactment 1997* and *Sarawak Wildlife Protection Ordinance 1998*.

The Customs Act 1967 and the *Sales Tax Act 1972* regulate the sale and export of *gaharu* in Malaysia by imposing a 5% sales tax and a 10% export duty on '*gaharu* wood chips' (*Customs Duties Order 1996*, HS Code 1211.90 200). The export duty was however removed in 2003 *(Customs Duties (Amendment) (No. 5) Order 2003)*. *The Customs*

(Export Prohibition) Order 1998 and the *Customs (Import Prohibition) Order 1998* both require that all exporters and importers of logs (HS Code 44.03 which includes logs of agarwood-producing species) obtain a license from MTIB. In addition, the *Customs (Prohibition of Imports) (Amendment) (No. 4) Order 2006*, which came into operation on 01 June 2006, requires that all imports of agarwood into Malaysia be accompanied by an import permit as stipulated under CITES, issued by or on behalf of the Director General of MTIB (Sch 4, 51(5)(b); 52(5)(b)).

The *Sale of Drugs Act 1952* regulates the sale of gaharu oil, perfume and medicine while the *Control of Drugs and Cosmetics Regulations 1984* made under this Act requires that these products be registered with the Drug Control Authority and that all manufacturers, importers and wholesalers be licensed. Also of some relevance is the *Local Government Act 1976* which has provisions for the licensing of the retail sales of goods.

Peninsular Malaysia and Federal Territories

The National Forestry Act 1984 (amended 1993) regulates the collection of minor forest produce through the application of licenses. There is no specific category for agarwood in the State *Forest Rules* made under the Act. In Peninsular Malaysia, wood chips, powder and oil are classified as minor forest products in accordance with Section 2(b) of the Act and a license is required for collecting. However, for the purpose of the collection of royalties, *gaharu* comes under an open clause of the Royalty Rate List that states 'Minor Forest Produce: Miscellaneous – Forest produce not mentioned above' (e.g. Pahang *Forest Rules 1987* Sch II (ii) 2.11 (d)). Such harvest requires a license or permit issued by the State Forestry Department. There is no provision in Peninsular Malaysia that declares agarwood-producing species as totally protected. Any individual caught without a license will be charged and on conviction will be fined not more than MYR 500,000 (approx. US $156,250) or imprisoned for not less than one year but not more than 20 years or both.

Sabah

The Sabah *Forest Rules* 1969 fix the royalty rate on gaharu at 10% of the value (Sch II, Pt A, s(h) 'Minor Forest Produce (Damar, Fossil, Gums, *Gaharu*, Cinnamon, Sticks, Tengkawang, etc)'). The *Rules* originally listed *Aquilaria malaccensis* as a Commercial Species, Class J, with a minimum felling diameter of 60 cm dbh (Sch I). However, effective 02 January 2004, the Sabah Forestry Department has classified *A. malaccensis* as a prohibited species to be retained inside Forest Reserves (Sch C;

Clause 1(31) of the *Standard Sustainable Forest Management Licence Agreement* – s 15(1) *Forest Enactment* 1968). In addition, the *Sabah Wildlife Conservation Enactment 1997* requires a permit for harvesting any species listed in Appendices I and II of CITES. Beginning in 2004, Sabah imposed a ban on *gaharu* extraction from its Forest Reserves while the local CITES Management Authority has been requested to verify extraction permits with the State Forest Department.

Sarawak

Although the State *Forest Rules* made under the *Forest Ordinance* 1958 contain detailed prescriptions governing the collection of royalties and fees, as well as collection of latex and resin from a number of tree species, there is no specific provision for agarwood. Provision for the collection of royalties on *gaharu* harvested in Sarawak under license is set out in section 52(2). Sch I, Class III, Miscellaneous, 'Other forest produce not specified above', with the rate specified as 10% *ad valorem*. Fee to collect is set at MYR1.00 per month (Sch 2 H. 'Other forest produce') payable at the time of the issue of the permit (s 52(4)).

The key agarwood-producing species in Sarawak, *Aetoxylon sympetalum, Aquilaria beccariana* and *A. microcarpa*, are specifically listed as 'protected plants' under the Sarawak's *Wildlife Protection Ordinance 1998* (Part II of the Second Schedule). A permit from the Controller of Wildlife is required to harvest and trade in these species as well as any plant species included in CITES Appendices I and II. The application fee for such permits is MYR100 per year. Any party that contravenes this Ordinance will be charged and on conviction a fine of MYR10,000 (approx. US $3,125) or one year imprisonment. In addition, the *Sarawak National Parks and Nature Reserves Ordinance 1998* makes it an offence for any person to collect or remove gaharu from any national park or nature reserve.

There is an apparent disregard for these laws as seen from the increase in illegal harvest activities. Numerous attempts have been made to control the illegal collection of *gaharu* undertaken either by foreigners or extracted from areas protected by law. Between 1992 and 2005, at least 197 *gaharu*-related arrests were reported (Lim *et al*. in prep.). Enforcement agencies have worked together to address the problem of illegal harvest by foreign collectors. Police and the Armed Forces are regularly assisting the State Forestry Departments, State Departments of Wildlife and National Parks (DWNP), Johor National Parks Corporation and other agencies in charge of protected areas. Army patrols have been sent into national and state parks to investigate incursions by illegal collectors while DWNP and the Police have established 'round-the-clock patrols' in Taman Negara and along the

East-West highway in Peninsular Malaysia (Anon. 1995). In 1999, the Perak State Government announced an informant reward system to curb *gaharu* smuggling (Anon. 1999). In addition, crack-down operations are intermittently conducted in the respective states. Despite the close cooperation between all enforcement agencies, reports indicate that illegal *gaharu* collection continues to escalate (Anon. 2004a).

The International Trade in Endangered Species Act 2008 *[Act 686]* was passed by Parliament on 24 December 2007. The Act provides for the administration and management of international trade in endangered species to ensure that the trade does not threaten the survival of any species of wild fauna and flora. The Act will be gazetted soon and regulations are being drafted to ensure its smooth implementation.

3 UTILIZATION AND TRADE FOR MALAYSIA

3.1 Type of use (origin) and destinations (purposes)

Agarwood is used for medicinal, aromatic and religious purposes in Buddhist, Jewish, Christian, Muslim and Hindu societies. The centuries-old trade was initially confined to very specific markets but has increased dramatically since the 1970s with economic growth, especially in the Middle East and northeast Asia consumer markets.

Historically, *gaharu* uses in Malaysia included the aromatic range (i.e., perfumery, fragrance, pharmaceutical (medicine and aromatherapy)), religious, ceremonial and spiritual rituals (burnt offerings, idols, rosary), and decorative carvings. The use of a piece of agarwood largely depends on its grade and the ethnicity of the user.

Agarwood-producing species are traded in a variety of forms ranging from whole plants (seedlings) and logs to chips, flakes, oil and spent powder wastes. The terms 'agarwood' and '*gaharu*' are usually taken to refer only to resin-impregnated pieces of wood (Grade C and above) that have been at least partially shaved of non-impregnated wood (the CITES terminology for these pieces is wood chips). Most forms of semi-processed or raw *gaharu* in trade only reach about 10 cm in length and can be accurately referred to as chips, fragments, shavings and splinters, even breaking down to tiny particles of powder and dust.

Major importing countries include the Middle East, Taiwan, Japan and Korea while the minor markets are the US and Europe. Singapore is a major entrepot. All derivatives are derived from wild specimens.

3.2 Harvest

3.2.1 *Harvesting regime*

Being a commodity that only in 1975 saw an increase in consumer demand, there are no operating provisions within the SMS imposing a harvesting regime on agarwood-producing species in natural forests except for the recently established Standard of Procedures (see section 2.1.3).

There are two main methods of harvesting *gaharu*: fatal harvest and sub-lethal harvest. The more commonly reported method is fatal harvest, whereby the whole tree is chopped down to harvest the *gaharu*. Early reports indicate that fatal harvests of *Aquilaria* in Peninsular Malaysia were already occurring in Johor (Bland 1886) and Selangor (Skeat 1900) during the 19th Century. Although such harvest generally kills the tree, many trees are able to coppice profusely (Green 1999). Corner (1978) found that the bark of *Aquilaria malaccensis* coppiced 7–8 months after being damaged. This allows the sub-lethal harvesting method to be employed. A report by the Thailand-based WildAid Foundation found that *Aquilaria* trees are relatively robust and can be tapped by chipping or cutting the infected part for over 10 years before they die (Anon. 2004b). Local communities involved in collection in Peninsular Malaysia routinely practise this harvest method on a rotation of 2–3 months where trees are still alive after 15 years of coppicing (Yamada 1995).

3.2.2 *Harvest management/control* (quotas, seasons, permits, etc.)

The commercial harvesting of *gaharu* requires a license and removal pass issued by the State Forestry Departments in Peninsular Malaysia and Sabah and the Sarawak Forestry Corporation. The removal pass is issued as proof that all fees have been paid and that the logs were harvested from a licensed area. The Forestry Department has not reported the issuance of licenses for the collection of *gaharu* in Peninsular Malaysia.

Malaysia subscribes to the setting of a harvest quota and permit requirement of CITES. The harvest and export quota for 2007 and 2008 have been submitted to the Secretariat. In Sabah, official records indicate that agarwood is extracted only for its timber and not for other purposes. However, the production and trade of agarwood oil in Malaysia is not well monitored. The Malaysian Management Authorities for agarwood are MTIB (Peninsular Malaysia and Sabah) and Sarawak Forestry Corporation (Sarawak).

3.3 Legal and illegal trade levels

During 1995–2005, 6,092,024 kg of *gaharu* were exported from Malaysia (Anon. 2006b). During the same period, CITES permits were issued only for c. 3,000,000 kg of *gaharu*. In 2003 and 2004, the volume stated in CITES permits actually exceeded the volume of exports reported officially. The switch between declaration under HS Chapter 12 and Chapter 44 is the main cause of this large discrepancy.

As national stocks rapidly declined, collectors began to illegally harvest agarwood in neighbouring countries. Foreign nationals have been reported to be involved in illegal harvesting in Malaysia since 1987 (Anon. 2004a). These foreigners are predominantly from Thailand, Cambodia, Indonesia and the Philippines. The harvesting took place both in the Permanent Reserved Forests and totally protected areas. Notable cases of illegal harvesting took place in Taman Negara and Endau Rompin National Park, a National Park and State Park respectively, with totally protected status. Collection of *gaharu* by local communities has been impeded by the presence of foreign collectors (Faezah 1995, Anon., 2004c), many of whom are equipped with firearms (Anon. 2002).

Collectors from Thailand were also reported to be active in Sabah in 1999 and in Sarawak in 2005 (Dawend et al., 2005). Given the extensive border shared between Indonesian and Malaysian Borneo, Indonesian collectors have probably been active in Sabah and Sarawak for many years. In addition, collectors from the Philippines have also been reported to be collecting gaharu in Sabah and Sarawak. Several arrests had been made in Sabah and Sarawak since 2000.

II. Non-detriment finding procedure (NDFs)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

The NDF is preliminary.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED. BIOLOGICAL CHARACTERISTICS OF THE SPECIES, REGULATION OF HARVEST AND TRADE STATISTICS.

The criteria, parameters and/or indicators used to prepare the non-detriment finding for *Aquilaria malaccensis* are:

- density and demography of selected populations occurring in the various Permanent Sample Plots (PSPs) and plots laid out for national forest inventories (NFIs);
- harvesting limits employed under the Standard of Procedures; and
- pattern and level of exploitation for international trade, including trade statistics.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The data for density and demographic patterns are obtained from field evaluation on the above-mentioned plots and plots established for academic research. For the plots established under PSP and NFI, the published data is data that has been analysed. National Forest Inventories are conducted only for Peninsular Malaysia. Also see literature cited.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

None.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

The major problems include:

- Very little is known about *Aquilaria malaccensis's* population distribution patterns, demography, ecology, flowering phenology, reproductive behaviour, fruit production, recruitment and regeneration patterns, natural mortality, and mortality/regeneration caused by stem damages. Its widespread but low density occurrence exacerbates this problem.
- Little information is available on the response and rate of infection in naturally occurring trees, on the quality of infected resinwood, and on recovery rates (volume) of chips, particularly those used for oil production. The grade of the *gaharu* resin in trees cannot be easily determined with full certainty and infected trees lack definitive external signs indicating resin grade. This leads to indiscriminate harvesting which poses many problems to sustainability and regulation of legal harvests. In cases where the resin is absent, felled trees and stumps are left standing in anticipation that a resin-producing reaction will take place.
- The scenario for other species of *Aquilaria* is even more acute. The discord between taxon recognition and the inability of the industry/trade to segregate harvest products according to taxon as

required by CITES should be addressed. Any procedures that aim to control harvests must recognize the above limitations.
- Current procedures to control harvesting, manufacturing and trade need to be reviewed for effective monitoring.
- As different agencies are tasked with managing the same forested areas where agarwood occurs, a coordinated approach towards monitoring is crucial.

There have been some management interventions such as licensing and establishment of cultivated *Aquilaria*. Malaysia has yet to produce agarwood from these cultivated trees.

6. RECOMMENDATIONS

Recommendations must be relevant to the major problems outlined above. In view of these, the criteria, parameters and/or indicators currently used to prepare the non-detriment finding for *Aquilaria malaccensis* are deemed to be appropriate. The data quantity and quality for NDF can only be evaluated with respect to current stocking.

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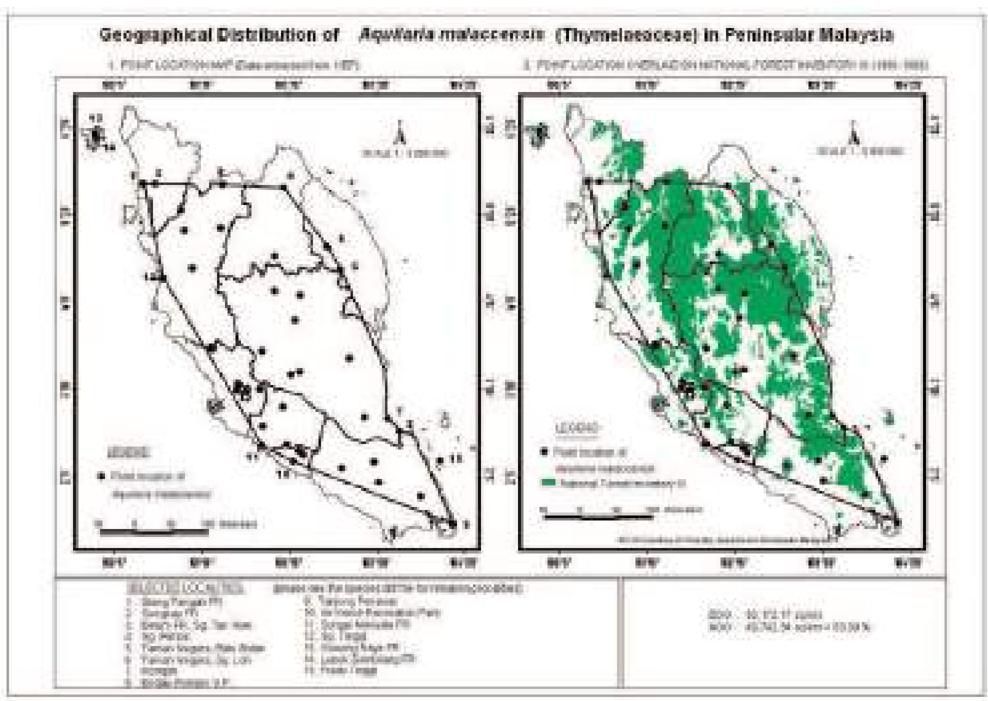


Figure 1. The geographical distribution of *Aquilaria malaccensis* in Malaysia.

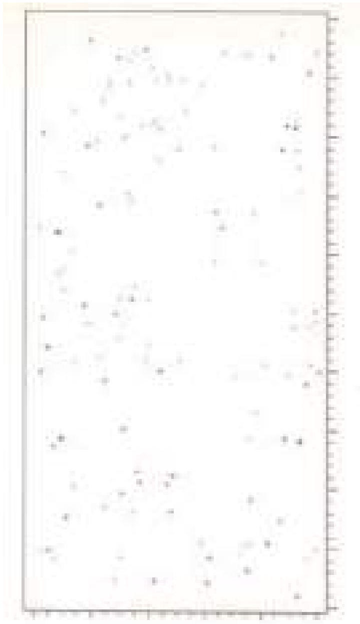


Figure 2. The distribution of *Aquilaria malaccensis* in the Pasoh 50-ha tree demograhic plot.

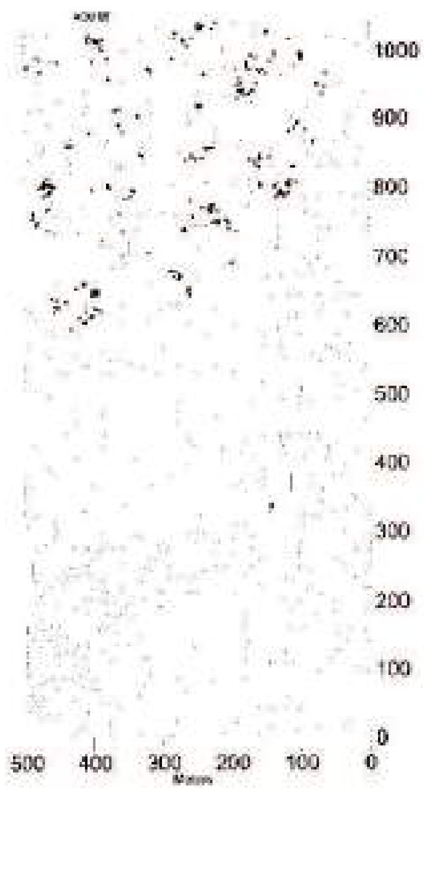
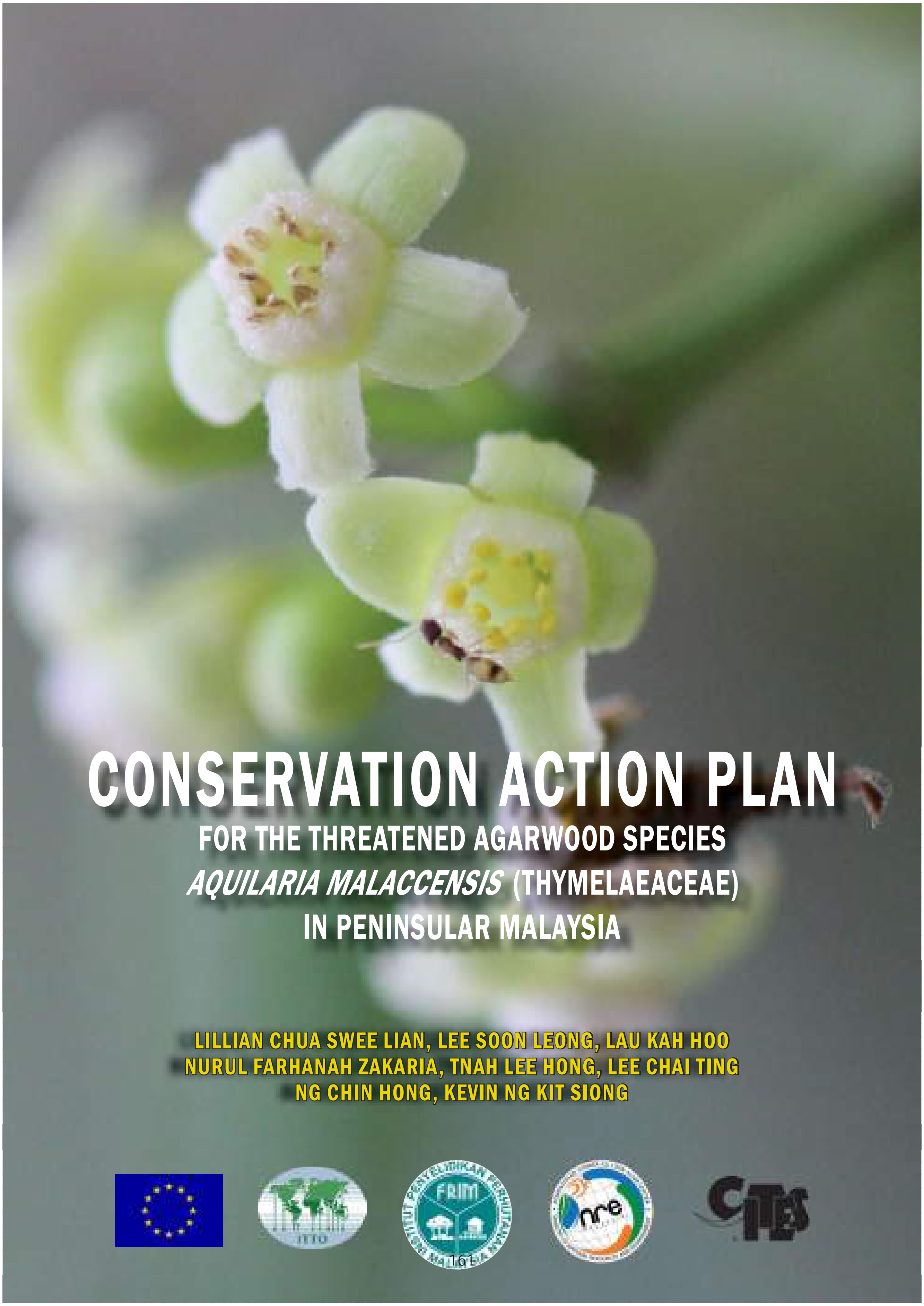


Figure 3. The distribution of *Aquilaria beccariana* (>1 cm dbh) in the 52-ha plot in Lambir Hills National Park.

Appendix 1. Major agarwood-producing species native to Malaysia.

Species	Distribution in Malaysia (State)
Aetoxylon sympetalum Airy Shaw	Sarawak
Aquilaria beccariana Tiegh.	Johor, Sabah, Sarawak
Aquilaria hirta Ridl.	Peninsular Malaysia (Terengganu, Pahang, Johor)
Aquilaria malaccensis Lam.	Peninsular Malaysia, Sabah, Sarawak
Aquilaria microcarpa Baill.	Sabah, Sarawak
Gonystylus brunnescens Airy Shaw	Peninsular Malaysia, Sabah, Sarawak
Gonystylus confusus Airy Shaw	Peninsular Malaysia
Gonystylus macrophyllus (Miq.) Airy Shaw	Peninsular Malaysia, Sabah, Sarawak
Wikstroemia androsaemifolia Decne.	Peninsular Malaysia, Sabah, Sarawak
Wikstroemia polyantha Merr.	Peninsular Malaysia, Sabah, Sarawak
Wikstroemia ridleyi Gamble	Peninsular Malaysia (Kelantan, Terengganu, Pahang)
Wikstroemia tenuiramis Miq.	Sabah, Sarawak


CONSERVATION ACTION PLAN
FOR THE THREATENED AGARWOOD SPECIES
AQUILARIA MALACCENSIS (THYMELAEACEAE)
IN PENINSULAR MALAYSIA
LILLIAN CHUA SWEE LIAN, LEE SOON LEONG, LAU KAH HOO
NURUL FARHANAH ZAKARIA, TNAH LEE HONG, LEE CHAI TING
NG CHIN HONG, KEVIN NG KIT SIONG
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Conservation Action Plan for the Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia

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2016

Date of Publication: September 2016

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Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Chua, Lillian Swee Lian
Conservation Action Plan for the Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia / Lillian Chua Swee Lian, Lee Soon Leong, Lau Kah Hoo, Nurul Farhanah Zakaria, Tnah Lee Hong, Lee Chai Ting, Ng Chin Hong, Kevin Ng Kit Siong.
Bibiliography: page 63
ISBN 978-967-0622-59-0
1. Agarwood (Wood)--Conservation--Malaysia
2. Agarwood (Wood)--Planting--Malaysia
I. Lee, Soon Leong. II. Lau, Kah Hoo. III. Nurul Farhanah Zakaria.
IV. Tnah, Lee Hong. V. Lee, Chai Ting. VI. Ng, Chin Hong.
VII. Ng, Kevin Kit Siong. VII. Title
634.9709595

MS ISO 9001:2008 Certified

Design and typesetting: Siti Fariezza Khairi Thaw

Front cover: An insect visitor on a newly opened and older flowers of *Aquilaria malaccensis.*
Photo: Lau Kah Hoo
Back cover: A large *Aquilaria malaccensis* tree in the forested area of Universiti Teknologi PETRONAS, Perak. Photo: Lee Soon Leong

Printed by Forest Research Institute Malaysia, Kepong

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The ‘Conservation Action Plan for the threatened agarwood species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia’ is a timely production by researchers from Forest Research Institute Malaysia (FRIM), their counterparts, and stakeholders that were involved. As one of the range states for *Aquilaria* and an important trading hub for agarwood species, Malaysia has the obligation to deliver a Non-detriment Findings.

Foreword

Since its inclusion in the Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 2005, the entire genus of *Aquilaria* has gone through substantial regulatory stages in its chain-of-custody in order to prevent unsustainable harvesting in its range states and trading worldwide. The Management Authority (MA) from these range states are empowered to manage the trade of the listed species, and to enforce the regulations. They collaborate with the Scientific Authority (SA) and local enforcement agencies to undertake the management of the resource.

Knowing its biological behavior and genetic diversity is the first step towards addressing the problems faced by the species with regards to conservation and management. In the attempt to save *A. malaccensis*, FRIM has undertaken several research projects funded by Government of Malaysia and international agencies to carry out reproductive and genetic studies in Peninsular Malaysia.

I thank the research team in taking the initiative to tackle this challenging issue. It is my hope that all relevant parties would study and refine the Action Plan and take the necessary steps in ensuring that the wild populations of *A. malaccensis* will continue to be sustained in the future.

Dato’ Dr. Abd. Latif bin Mohmod
Director-General, FRIM

Preface

The Conservation Action Plan for the species *Aquilaria malaccensis* is produced after seven years of data accumulation and analysis over three phases of projects. The project included two phases which were funded by the Government of Malaysia and one from the ITTO-CITES program.

Over the years, one of the major threats to its populations, i.e., illegal harvesting has been on the increase. While much effort and enforcement activities have been carried out to curb these activities, the rate of loss resulting from harvesting is much higher than its ability to regenerate. In addition, the biological behaviour of the species as well as other threats such as land use change and climatic factors contribute to the population decline in the country.

The Action Plan has targeted six main objectives to be achieved in a period of five years. Various implementing agencies and landowners are key players in engaging the activities outlined in the Action Plan. In each activity, an indicator or milestone is suggested for the purpose of monitoring the progress of the activity. The success of the implementation, and the conservation of *A. malaccensis*, is very dependent on the involvement of all stakeholders.

Dr. Lillian Chua Swee Lian
Director, Forest Biodiversity Division, FRIM

Acknowledgements

This work was made possible by a grant from ITTO under the collaborative program with CITES “Support to ITTO: CITES Implementation for Tree Species and Trade/Market Transparency (TMT)”. Donors to this collaborative program include the EU (primary donor), the USA, Germany, the Netherlands, Norway and China. The project commenced from 2013 until 2015.

The project was also partially funded by the Ministry of Natural Resources and Environment (NRE) and Ministry of Science, Technology and Innovation (MOSTI) of Malaysia between 2011–2012 and 2007–2008 respectively.

The Action Plan would not be materialized without the excellent team of supporting staff from the Conservation and Biodiversity Informatics Branch (Damahuri Sabari, Ayau Kanir, Hamidi Abu Bakar, Alang Mahayu, Mohd. Zian Salehin, Norzamli Amli, Norazmi Amli, Ahmad Raffizi Othman and Zarul Zurhaidy Tahir) and three former staff Hazlina Ali, Amir Nurdin Abdul Rahman and Azril Alias. The late Chan Yee Chong is also recognized for his work during the earlier stage of the project to determine populations and study sites. Batches of interns from various universities helped in the field and samples processing; Ng Choi Ling, Sam Wai Kit, Nur Ashiqin Abdul Hamid, Sam Pui Kwan, Nurlina Ridwan, Siti Nor Hidayati Kamaruddin and Heng Pooi San of whom their attachment in FRIM were timely. Over in the Genetics Laboratory, Sharifah Talib, Ramli Ponyoh, Yasri Baya, Suryani Che Seman, Ghazali Jaafar, Yahya Marhani, the late Zakaria Yusoff, Hamiliar Hamid and Nur Azizi Abdul Rafae are acknowledged for their assistance in the laboratory and field.

Mohamad Shahfiz Azman helped to identify the small mammal and Ong Su Ping with the insect predators. Phon Chooi-Khim, Nur Zati Akma Mustafa, Seiki Yamane, Muhammad Dzulhelmi Muhammad Nasir, John S. Ascher, Chey Vun Khen and Roger Kendrick are entomologists who identified the insect visitors.

Sincere thanks are also due to the Centre for Tropical Forest Science and Forest Research Institute Malaysia (FRIM) for the permission to use the ecological data from a research plot. The data are invaluable to support the findings in this report.

The Forest Department of Peninsular Malaysia, State Forest Departments (Kedah, Pulau Pinang, Perak, Selangor, Negeri Sembilan, Melaka, Johor, Pahang, Terengganu, and Kelantan), Universiti Teknologi PETRONAS, Penang Botanic Gardens, Department of Wildlife and National Parks (DWNP) and National Landscape Department are acknowledged for granting permission to work in the forest under their jurisdiction. We also gratefully thank the District Forest Officers and staff of the Rangers’ Office who provided assistance and logistic support during the field trips.

Input, feedback and ideas from the participants of the Stakeholder Dialogue held in Putrajaya in September 2015 are most appreciated and much valued in our attempts to save the remaining *karas* populations in Peninsular Malaysia.

Summary

Agarwood products exported from Malaysia are mainly derived from wild populations of *Aquilaria* spp. where harvesting pressures have been intense as a result of a lucrative market. Previous qualitative-based projects have speculated on a decline in the resource. This Activity was undertaken to determine the extent of harvesting impact on the survival of extant populations. The results collectively show that the species is not resilient to current harvesting activities. The declining trend in its population change and nation-wide abundance observed since the late 1980s, in addition to higher mortality rates in small and largest diameter classes, supra-annual flowering behaviour and substantial abortion of its flowers and fruits indicate that the populations cannot withstand the continued onslaught of harvesting. The species shows extensive gene flow which arises from an efficient seed dispersal mechanism and high outcrossing rates. There is high genetic diversity and low population differentiation. Two distinct clusters have been detected and these are geographically defined. Drawing from the results of this Activity and other related projects, a partial Non-detriment finding is presented and a conservation action plan (CAP) developed as a measure to prevent a catastrophic decline. The objectives and actions related to *in situ* and *ex situ* conservation, management of the resource, artificial propagation, enforcement, research and development and strengthening cross-sectoral enabling factors are presented here.

Aquilaria, of the family Thymelaeaceae and known worldwide as agarwood and in Malaysia as *karas*, is a genus of 15 species and is confined to the Indo-Malayan region of the Asia-Pacific. It is distributed from the Assam district in India, Myanmar and south-eastern China (Hong Kong and Hainan) to south-east Asia (Indochina, Borneo, Philippines, Malay Peninsula, Sumatra, Moluccas and New Guinea (Ding Hou 1960) (Fig. 1.1).

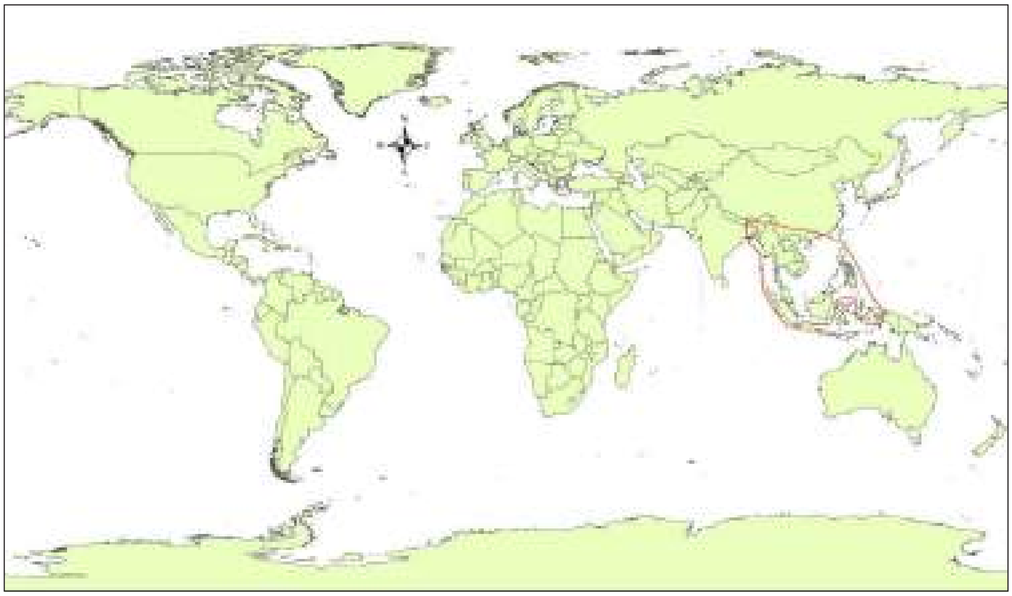


Fig.1.1. Global distribution of the genus *Aquilaria* (Ding Hou 1960).

In Malaysia, five species of *Aquilaria* (*A. beccariana*, *A. hirta, A. malaccensis*, *A. microcarpa* and *A. rostrata*) are known and in the peninsula, four species with the exception of *A. microcarpa* are present. *Aquilaria beccariana* occurs in the lowland and swamp forests of Johor (Ding Hou 1960); *A. rostrata* is confined to Mt. Tahan in the Taman Negara National Park and Besut, Terengganu while *A. hirta* is mainly found on the east coast. *Aquilaria malaccensis* is by far the most widespread and common, until recently, in many states (Whitmore 1972). This species is absent in Sarawak but reappears in Sabah and Kalimantan on the island of Borneo (Tawan 2004). Fig. 1.2 shows the range distribution of the genus in Malaysia.

Fig.1.2. Distribution of the genus *Aquilaria* in Malaysia (shaded areas) (not drawn to scale).

Members of the genus *Aquilaria* in Malaysia are trees often taller than 20 m. *Aquilaria malaccensis* may reach 40 m tall although in reality, no trees of such stature have been observed in the recent past. It has smooth bark and glabrous leaves with many lateral veins (up to 16 pairs) and these are distinct on the leaf undersurface. The plant may bear terminal and/or axillary inflorescences which are often branched with 2−3 umbels, of which each bears up to 10 flowers. The flowers are tiny (up to 6 mm) while the fruits are pear-shaped, 3−4 cm in length with no distinct stalk. It generally has one seed which is densely covered with red hairs. In Malaysia, *A. malaccensis* is found on both well-drained soils and water-logged areas in the lowland and hill forests dominated by dipterocarps. Its altitudinal range is up to 750 m above sea level (Ding Hou 1960). Although the species appears to be common in both primary and regenerated logged-over forests, trees are essentially scattered (Whitmore 1972, Manokaran *et al.* 1992, Jutta *et al*. 2009) (see also results of this study). It is neither gregarious nor forms dominant stands in the habitats it occupies. Being an intermittent food source for some animals (see results of this study), it is unlikely to be a keystone or guild species. Lacking dominance and because of the complex interaction of many biotic and abiotic factors in the tropical rain forest, its role in its habitat is not clearly understood. Thus the effects of its removal through over-harvesting on ecosystem processes are not yet known.

According to the IUCN Red List version 2015.2, globally, *A. beccariana*, *A. hirta* and *A. microcarpa* are Vulnerable (VUA1d). *Aquilaria malaccensis* is also Vulnerable (VUA1cd) while *A. rostrata* is Critically Endangered (CRB1ab(v)). Refer to World List of Threatened Trees (Oldfield *et al*. 1998) and IUCN (2001) for details of the categories and criteria. In Malaysia, *A. beccariana, A. microcarpa* and *A. rostrata* are Data Deficient (DD) while *A. hirta* and *A. malaccensis* are Vulnerable (VUA4cd) (Malaysia Biological Diversity Clearing House Mechanism (http://www.chm.gov.my)). There is no data on the global population size for each of these species. The main threat to the wild populations of *A. malaccensis* in Malaysia is over-harvesting while *A. beccariana* suffered from habitat loss. *Aquilaria rostrata* is legally protected by virtue of it occuring in the national park.

Aquilaria species is the principal source of agarwood, a highly valuable fragrant wood used for incense, traditional medicines and in the perfumery industry. Its use as incense in ceremonies, rituals and meditation practices in Buddhism, Confucianism and Hinduism is widespread. In the Middle East, *oud* which is Arabic for agarwood, is considered a symbol of wealth, status and hospitality (Chang *et al*. 2001). As medicine, the incense is used to treat thyroid cancer, asthma, colic, diarrhoea and abdominal complaints, among others (Chung & Purwaningsih 1999). All parts and derivatives of the plant including the roots, fruits, seeds and seedlings are traded either as raw, semi-finished or finished products (see PC22 17.5.3 Glossary of Agarwood Products). The method of harvesting wild trees has been described by Soehartono & Newton (2001c).

Other genera in the family Thymelaeaceae also produce oleoresins in the heartwood as a wound reaction. In international trade, apart from *Aquilaria*, agarwood may comprise species of *Gyrinops* but this genus is absent in Malaysia. Similar resin impregnated heartwood is also found in *Gonystylus* (Ramin) and it is reported to be similarly used in small quantities (Soerianegara *et al*. 1993). Ramin is however more highly prized for its fine-grained timber. The resin impregnated heartwood of *Aetoxylon sympetalum*, a monotypic genus endemic to Borneo (Sarawak and Kalimantan) but not listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices, is also an important source of *gaharu* oil and incense. Some members of the genus *Enkleia*, *Phaleria* and *Wikstroemia* also produce these in small quantities. Of Peninsular Malaysia's *Aquilaria* species, all four are believed to produce the aromatic resin when injured (Chang *et al*. 2001). However, *A. beccariana* and *A. rostrata* are extremely rare and because of this, they most likely do not get into the trade.

Since 2010, Malaysia has capped an export quota of 200,000 kg per annum of *A. malaccensis* blocks, chips, sawdust and its derivatives. The harvesting intensity for *karas* can be gleaned from its past export records. The export trend from Malaysia fluctuated between the years 1995 and 2006 after which it stabilised (Fig. 1.3) (CITES 2015 Trade database extracted for Malaysia (originating and/or exported) for the period 1995 to 2013). The rather abrupt increment before the end of the 20th century is most likely a response to soaring demand and high pricing of agarwood products—this rapid rise in demand has also been reported elsewhere (Barden *et al*. 2000). However, the export volume plummeted in the years immediately preceding 2004, that is the year when both genera of *Aquilaria* and *Gyrinops* were listed in Appendix II. The dramatic increase in 2005 may be due to reporting error, in particular the transaction of 12,564.5 kg of oil. According to the United Arab Emirates (UAE) standard, one litre of agarwood oil requires 144 kg of chips and one litre of oil is equivalent to 1 kg. This meant that close to 1,800 tonnes of chips were used to produce the reported volume of oil. During that year, Malaysia imported only 195 tonnes of chips. Whether or not such an amount of *Aquilaria* biomass was present in Malaysia is uncertain. Regardless, it is apparent that trade is singularly the most important contributor to the rapid decline of the resource because during this period, the other potential threat to wild populations, i.e., forest conversion had already stabilised in the peninsula. Minor fluctuations seen after 2006 may be the result of a persistently low availability of the resource and the regulatory mechanism that was created to address this decline. Now trade in *Aquilaria* from Malaysia is highly regulated and closely monitored by national and international stakeholders. Low export volumes reported before 1997 were possibly due to a combination of factors such as less rigorous reporting by range states and monitoring by

CITES, and low demand for agarwood products. Note that in generating the export trend, two approaches were used: (1) to avoid double counting, the weight of chips used to produce the oil is removed from the calculation although in real terms the residual powder is often exported in other forms; and (2) all imports are considered as re-exports. Harvest data is not available so the export figures, as reported in the CITES trade database, were used as proxy data. There had been efforts to gather harvest information from people involved in the production of parts and derivatives but their answers were often vague and indefinite. Soehartono & Newton (2001c) reported a highly volatile nature of the Indonesian agarwood trade but acknowledged that several factors, including inadequate and manipulated reporting and occurrence of illegal trade, had constrained the analysis of the trade trend.

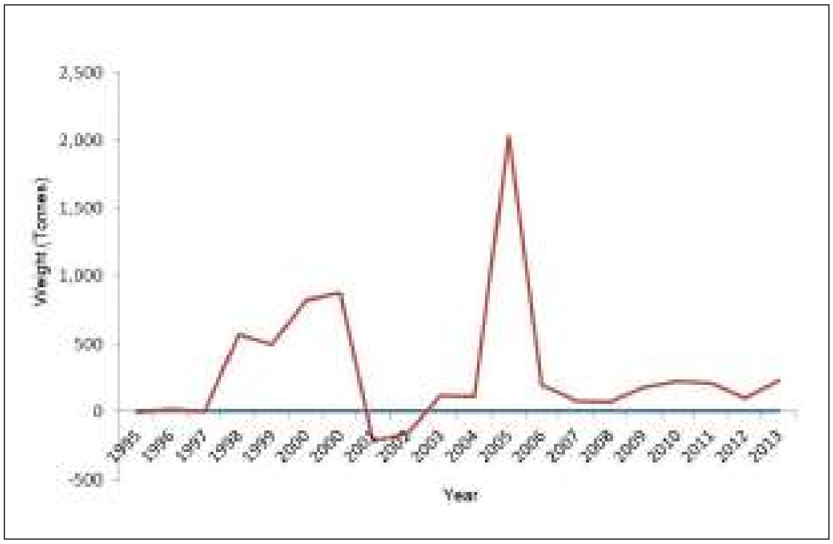


Fig.1.3. Summary of *Aquilari*a spp. exported from Malaysia for the period 1995 to 2013. The extreme spike in 2005 could be due to reporting error. The terms and units reported were in oil and kg respectively. One kg or litre of oil requires approximately 144 kg of wood chips.

Under the National Forestry Act (1984, amended 1993; Act 313), *karas* is considered a minor forest produce. In the peninsula, although indigenous and local communities are permitted to roam the forests freely, the land and its resources belong to the State government and a license is required to harvest forest resources from the Permanent Reserved Forests (PRFs) and Stateland. Where local villagers and *Orang Asli* (indigenous) communities are concerned, *karas* is considered a minor produce harvested in small quantities which formed part of their livelihood. With regards to the licence holder, any timber, blocks or chips of *karas* that leave the PRF or stateland must be accompanied by a removal pass. This pass is mandatory and contains information that is subsequently used by the state authorities to calculate royalties, premium, cess and other charges. This entire process is a form of monitoring as the pass is required when applying for other permits such as the CITES export permit, and the state authorities get to keep records of harvest. Since 2004, control has been applied through the national export quota. To date, we are not aware of any harvest or management plans that are applied by the state authorities on the harvesting of wild *karas* populations in the PRFs and Stateland. The standard forest management prescriptions such as the application of an annual allowable coupe, minimum cutting limit of 45 cm dbh, retention of mother trees and other silvicultural practices are not employed on *karas*. In protected areas such as national parks, state parks and protection forests in the PRFs, no form of harvesting is permitted. In reality however, this is not adhered to as the lure of a lucrative income is too tempting to be ignored. Since any form of management and/or monitoring of the resources is undertaken by the state authorities and such data is confidential, we have no knowledge of the proportion of legally harvested *karas* that enters into the process chain.

These are some adaptive management measures that Malaysia practises to make harvesting of its natural resources more sustainable. These include more significantly, the greater spirit of cooperation and collaboration between primary stakeholders (such as the state authorities) and other enforcement agencies such as the police and armed forces, customs, maritime and immigration authorities. Concurrently, Act 313 is being revised to take into account the changing patterns in the forestry sector and the need for a greater emphasis on forest enforcement, integrity, and conservation of the ecosystem roles it provides to environmental and public health.

Trees in the study sites have not been spared from illegal harvest. From the period beginning March 2011, 25.2% of trees in the observed populations were lost, with 85.8% of the loss caused by illegal harvest while the remaining died naturally. From this loss, trees of diameter at breast height (dbh) greater than 30 cm comprised 57.1% while a further 25.7% was in the 20−29.9 cm dbh range. Large trees are prime targets as they have a higher potential for resin development. Fig. 1.4 shows the increasing tree loss in the study sites due to illegal harvesting activities. Illegal harvesting was most rampant at Site 2 (see section 2.1 for site description) possibly because of its accessibility and inadequate enforcement. Despite attempts by the state authorities to curb the illegal harvests mass media reports of such activity occurring in different states in the peninsula have regularly appeared in the past few years (Table 1.1). There is evidence to show that many of these activities were conducted by foreigners (Annex 1). It is not known how significant the illegal harvest is because it is virtually impossible to enumerate population sizes in its distribution range. Market and supply chain information do not distinguish parts that are obtained legally or illegally and traders basically are not aware of or concerned about the harvesting implications. CITES export permit data do not differentiate between the legally versus illegally obtained products. The substantial penalties imposed by the International Trade in Endangered Species Act 2008 (Act 686) and National Forestry Act 1984 (Amended 1993) do not have any impact unless such harvesters are apprehended. There had been several reports of prosecution, e.g., in its 14 August 2004 edition, The Star newspaper reported that between 2001−2002, 19 Thai nationals had been caught for illegal extraction of *karas* in protected areas (Annex 1). However, this did not include cases that had been reported by Malaysia in its biennial reports to CITES (Table 1.2).

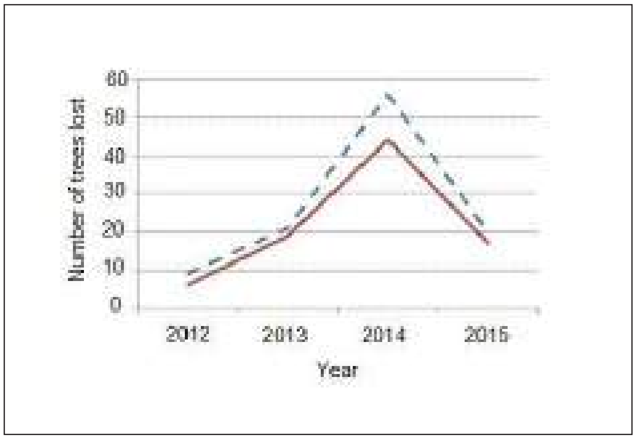


Fig.1.4. Number of *Aquilaria* trees lost in the study sites during the period March 2012 to September 2015. The apparent drop in 2015 could be due to enhanced enforcement activities. Solid and dashed lines indicate S2 and all sites respectively.

Table 1.1. Compilation of news reports on the illegal harvest of *Aquilaria* in the peninsula.

State	Year	Date of report	Location	No. trees/kg of chips, blocks
Penang	2014	Feb-19	Mt. Erskine	NA
Penang	2014	Feb-19	Batu Ferringhi	NA
Perak	2014	Feb-27	Grik	90 kg
Johor	2014	Apr-16	Endau Rompin National Park, Panti FR	NA
Penang	2014	Jul-09	Penang National Park	NA
Penang	2013	Oct-11	Near Penang Botanic Gardens	NA
Penang	2012	Feb-23	Gambier Hills	NA
Penang	2012	Feb-28	Several sites near Butterworth	NA
Penang	2012	Mar-05	Mar Vista Resort and Chee Seng Garden in Tanjung Bungah	NA
Penang	2012	Mar-17	Fettes Park in Tanjung Bungah	NA
Penang	2012	Mar-30	Simpang Empat in Nibong Tebal	51 kg
Penang	2012	Apr-02	Batu Ferringhi	3
Penang	2012	Nov-12	Taman Permai in Tanjung Bungah	NA
Penang	2012	Nov-12	Mt. Erskine	NA
Penang	2011	Oct-11	Bukit Panchor in Nibong Tebal	NA
Penang	2011	Oct-12	Cherok Tokun Hill in Bukit Mertajam	NA
Sabah	2010	Apr-13	Kalabakan FR	NA
Perak	2004	Aug-14	Belum Forest Reserve (FR)	NA

Table 1.2. Legal action taken by the Malaysian authorities against illegal *karas* harvesters since 2005 (extracted from Malaysia's biennial reports to CITES).

Year	Details	Amount	Value of fine (RM)	Jail term (months)
2005	In possession	7.4	NA	20
2006	Illegal entry	0	0	8
2006	Illegal entry	0	0	3
2006	Illegal activity	0	2000	0
2006	Illegal entry	0	1600	0
2008	Seizure of chips, blocks (kg)	15	NA	NA
2009	Seizure of chips, blocks (kg)	50	NA	NA
2010	Seizure of chips, blocks (kg)	5819	NA	NA
2010	Seizure of oil (litres)	4	NA	NA
2010	Seizure of wood (pieces)	3	3000	4
2011	Chips, blocks import without CITES export permit (kg)	17.4	NA	NA
2012	Import of saplings without CITES export permit (number)	3400	NA	NA

Currently harvest of agarwood from wild populations only occurs in the range states of Malaysia and Indonesia—the harvest is regulated through a quota system and is enforced through a legal framework at the national level and monitored by CITES. Malaysia, like other range states, has resorted to establishing plantations to take advantage of the profitable revenue and as a means to address the decline in wild populations. As required by Act 686 and Resolution Conf. 16.10 of CITES, some 53 companies and individuals in Peninsular Malaysia have registered their nurseries and plantations (including smallholdings) with the Malaysian Timber Industry Board (MTIB) which is the Management Authority (MA) in charge. Currently there are about 984 ha of plantations with c. 959,500 standing trees, mainly of *A. malaccensis, A. crassna* and *A. subintegra* (http://cites.org/eng/2015_india_agarwood_workshop). These are planted either as a mono-crop or intercropped with fruit trees and in village/community gardens. There is a report on financial subsidies being available for such plantation activities (Annex 2) but we were unable to verify it. The challenges faced by the *karas* plantation industry in Malaysia includes the lack of quality planting stock, processing chain not being readily available, lack of an international grading standard and high input costs that reduce the competitiveness of Malaysian agarwood products.

In order to reduce harvesting pressures on and decline of the wild *A. malaccensis* populations, a conservation action plan (CAP) is clearly required. To ensure the applicability of the CAP, management prescriptions that are formulated should be based on an understanding of the critical functional components that affect population regeneration and viability. Such components include reproductive ecology, fecundity (flowering phenology and floral biology) and genetic diversity. Thus, the objectives of the Activity were to: (i) document its flowering phenology and reproductive behaviour; (ii) develop DNA profiling databases for the species in Peninsular Malaysia; and finally (iii) prepare a CAP. Note that while this Activity did not aim to reduce the rate of illegal harvesting nor address issues associated with it, it is anticipated that in the incorporation of the measures recommended in the CAP, the rate of decline in the populations may be sufficiently arrested. The information contained in this report forms part of the Non-detriment findings (NDF) required by Resolution Conference 16.10 for agarwood-producing species with particular emphasis on biological characteristics and population status.

In this report we bring attention to the following: (1) although the Malay name *karas* refers collectively to the genus *Aquilaria*, in the context of this report/article, it refers to *A. malaccensis* only; (2) site names and coordinates are purposefully withheld to maintain anonymity and reduce harvesting pressures; (3) mature individuals are individuals that exceed the reproductive dbh threshold of 145 mm; (4) the data used in this report have been sourced from other projects, mainly the Centre for Tropical Forest Science and Forest Global Earth Observatory (CTFS-ForestGEO; see methodology for details). In the preparation of the CAP, information is also drawn from previous studies that were funded solely by the Malaysian Government such as "*In vitro* technology for mass propagation and phytochemical analysis of *Aquilaria malaccensis* and *Aquilaria hirta* (endangered gaharu producing species)" (undertaken 2007−2008) and "*Kajian pemuliharaan dan pembangunan penanda mikrosatelit DNA ke atas* Aquilaria malaccensis *(karas) di Semenanjung Malaysia*" (undertaken 2011−2012).

2.1 Location of sites

Site 1 (S1) is located in the state of Perak and is covered by periodically inundated freshwater swamp forest on Telemong-Akob-Local Alluvium soil, surrounded by urban and tin tailing landscapes. Mean annual rainfall is approximately 2150 mm—monthly rainfall means exceed 167 mm but annually there are two weak dry seasons occurring in the months of February and June, respectively. The lowest minimum temperature recorded during the period of January 2011–August 2015 was 18.7ºC and this occurred on 4 February 2014. The following day, the minimum temperature was also low at 19.3ºC.

Sites 2, 3, 4 and 5 (S2, S3, S4, S5) are located on Penang Island. S2 is situated in the northeast, in a recreational forest that is semi-wild and not managed but maintained as part of the recreational area while S3 is in a hill dipterocarp forest with an elevation of up to 320 m a.s.l.; both sites are surrounded by urban and built-up landscapes and categorised as steepland. S4, located in the northwest of the island, is also a recreational forest with an elevation of 90 m a.s.l. It is not managed but maintained as a part of the recreational area, while S5 is in a coastal lowland dipterocarp forest. For these sites, the mean annual rainfall is approximately 2448 mm—monthly rainfall means exceed 187 mm and annually there are two dry seasons occurring in the months of December−February and June. The lowest minimum temperature recorded for these sites was similar to that in S1.

Site 6 (S6) is located in the state of Negeri Sembilan. It comprises lowland dipterocarp forests—the southwest area is part of a river delta while the central and northeast areas are undulating up to 24 m elevation (Manokaran *et al*. 1992). Soils are of ultisol/entisol type (Adzmi *et al*. 2010, Baldeck *et al*. 2012). Mean annual rainfall is approximately 2000 mm—monthly rainfall means exceed 100 mm but annually there are two weak dry seasons (July and January) (Numata *et al*. 2003). Other site factors such as light intensity, below ground and nutrient fluxes have been reported respectively by Yoda (1978), Yamashita *et al*. (2003) and Yamashita and Takeda (2003). S6, established in 1985, is censused every five years following a standard protocol (Manokaran *et al*. 1990, Condit 1998) where all woody plants ≥1 cm dbh are identified, tagged, measured and mapped. To date six censuses have been conducted with the last one conducted in 2010–2011. Although no legal harvesting of *karas* is allowed, there were assumptions (LaFrankie 1994) and unofficial reports of illegal harvest since 1987. The growth, mortality, recruitment and abundance data used in this report is obtained from CTFS-ForestGEO.

Meteorological data (daily maximum and minimum temperature, mean relative humidity and rainfall) from the nearest government meteorological stations (Titi Gantong Agricultural Station for S1, direct distance of 13 km, March 2011–June 2015; Butterworth for S2 and S3, direct distance of 12 km, April 2011–June 2015; Muka Head for S4 and S5, direct distance of 3 km, April 2011–June 2015) were obtained from the Malaysian Meteorological Department. All analyses were conducted in R 3.2.0 (http://www.R-project.org) using available functions from its various packages.

2.2 Demography

2.2.1 Spatial pattern

S6 data from Census 6 (2010–2011) was used. Visually, most trees seem to be scattered randomly throughout the plot. To see whether the observed pattern is consistent with complete spatial randomness, the pattern was tested using Ripley's K(t) function (Ripley 1976). This function tests whether the distribution of trees is aggregated, regular or random and further tests how the observed pattern changes with the distance scale. The spatial pattern of the populations in S1−S5 was not run because plots were not placed in these sites.

2.2.2 Growth, recruitment, mortality and abundance

Using the S6 data, we compared the mean and confidence limits for the dbh distribution of the population between censuses from census 1 (1987) to census 6 (2011). As shown by Condit *et al*. (1998) and Kohyama *et al*. (2015), demographic growth is a predictor of future population trends. Therefore, we also compared the means for different dbh categories (10–50 mm, 50.1–100 mm, 100.1–200 mm and >200.1 mm). These means were compared to those of *Gonystylus maingayi*, the only other member of the Thymelaeaceae family that is present in S6. Growth, recruitment and mortality data was analysed using functions in the CTFS R Package (http://ctfs.arnarb.harvard.edu/Public/CTFSRPackage/).

The rate of change in the abundance of stems (P) between censuses was calculated as

$$P = \log(n_2) – \log (n_1)/t$$

where n_2 and n_1 are numbers of stems recorded at the final and initial census, respectively, and t is the mean time expressed in the number of years between censuses (Condit *et al*. 1998).

2.2.3 Abundance at the national level

The National Forest Inventory (IHN), conducted in the years 1991–1993 (IHN3, Chin *et al*. (1997)), 2002–2004 (IHN4, Anon. (2007)) and 2010–2013 (IHN5, Anon. (2014)), provide abundance data that spanned 20 years for both *A. malaccensis* and *A. hirta* (>15 cm dbh) in the production and protection forests under PRF and Stateland in Peninsular Malaysia. Forests covered in the IHN included both primary and logged-over forests of various ages. Chin *et al*. (1997), Anon. (2007) and Anon. (2014) provide details with respect to definition, map scale, sampling design, number of sampling plots, calculations and analysis of data. Detailed comparison of the IHN abundance data is not reported here as the sampling method used in IHN3 varied markedly from other IHNs. Although plot location was randomised in all three IHNs, the final selection of the sampling plot was based on whether the plot had the appropriate representation of the pre-determined strata. In using and presenting the results, we have made the following assumptions: (1) on the basis of rarity, *A. beccariana* and *A. rostrata* were most likely absent in the sampling plots; (2) in IHN5, only 1.1% of the sampling plots contained *karas*. The geographic distribution of *karas* is known to be widespread while its sister species *A. hirta* is more restricted, hence the IHN5 data likely underestimates the density of both species; (3) we used the area of occupancy (AOO) as defined by the World Conservation Union (IUCN 2014). The AOO is obtained from herbarium and voucher collections and written field notes from present and past projects; (4) the spatial pattern discerned from S6 was used as a guide; and (5) because we have no information on the location of the sampling plots, we did not attempt to segregate the data by species.

2.3 Flowering phenology and floral biology

2.3.1 Flowering phenology

A total of 423 trees ≥1 cm dbh were enumerated in S1−S5 following the method of Manokaran *et al.* (1990). Tree coordinates were acquired with Garmin 60CSX. Populations that are larger having individuals with a range of dbh size classes were selected for observation. S1 and S2 populations were visited bi-monthly while S3, S4 and S5 populations were visited once in 3–4 months, whenever possible.

Phenological observations of all 423 trees took place between 1 April 2011 and 31 August 2015. Fortnightly observations were changed to weekly and monthly when necessary for trees in S1 and S2. Leaf flush, floral budding, flowering, fruiting and fruit dehiscence were observed from the ground using a 12 × 42 5º angular field view Nikon binoculars. Leaf flushes which are formed at terminal and axillary branches were especially checked for flower buds as these are known to emerge together in several other tropical species. A tree is considered flowering when a small amount of flowers was visible. As its flowers are small, the flowering episode in some trees may be missed but the presence of fruits confirmed that flowering had taken place. Masting is deemed to occur when trees produced large seed crops and this event is synchronized within a population (Kelly 1994).

2.3.2 Floral and fruit biology

In 2013 observation towers of about 5 m height were erected at tree AM186 in S1 and tree AM27 in S2. Tree AM186 was 47 cm in dbh and 41 inflorescences bearing approximately 140 flowers and 430 flower buds were tagged in 2013. The tree was observed daily from 9−13 September 2013 between 15:00 on the first day until 12:00 the following day. Observations were made from 10:00 until 17:00 on 17−19 September and 23−25 September 2013. Tree AM27 has a dbh of 24 cm and was chosen because its low drooping canopy allowed detailed observation and examination. Initially, a total of 30 inflorescences bearing approximately 150 flowers and 270 flower buds were tagged in the same year. An additional 16 inflorescences bearing approximately 60 flowers and 90 flower buds were added later in that year. The tree was observed from 25−29 March, 1−5 April and 8−12 April 2013 from the tower. Daily observations began at 15:00 on the first day and ended at 12:00 the following day for the period 25-29 March and 1-5 April whereas from 8−12 April, observations were made between

09:00 and 12:00 daily. This duration covered the period from flower opening to early fruit formation; subsequent observations were conducted every two weeks.

Time of flower opening, anthesis and stigma receptivity were recorded for flowers in the tagged inflorescences. Anthesis and stigma receptivity tests were conducted on a total of 20 flowers of tree AM186 and 65 flowers of tree AM27. The tests were performed hourly on freshly opened flowers for 19 hours. Stigma receptivity was tested with Nile blue 1% (Owens *et al*. 1991) and hydrogen peroxide 3% (Valdiani *et al*. 2012). Because of the small flower size, both tests required that the female reproductive organ be isolated. In the Nile blue 1% test, the whole pistil was dipped into the solution and receptivity was confirmed when the stigmatic surface turned bluish. In the latter test, a single drop of diluted hydrogen peroxide was placed on the stigmatic surface. Presence of stigmatic activity was confirmed when bubbles were produced inside the droplet. The fruit dimension was measured from early formation until abortion or dehiscence. Developing fruits were observed for any abnormalities including signs of damage. Number of seeds per fruit was recorded where possible and the dimensions of 20 fruits were measured for tree AM27 and 7 for tree AM186.

2.3.3 Flower, fruit and seed production

Ten 1 × 1 m traps were positioned under tree AM186 in S1 and 20 under tree AM267 in S2 at the beginning of September and April 2013 respectively. The traps were set up 1 m above the ground and randomly placed under the tree canopy. Flowers and seeds were collected weekly, air-dried in an air-conditioned room at temperatures around 26ºC for at least 7 days and weighed using A&D FX-2000i Digital Weighing Scale. Where counting of flowers was not feasible, the mean weight of 30 replicates for 50 flowers in each trap was used to estimate the number of flowers from that trap on that particular day. The number of fruits and seeds from each trap was counted on a particular day. In cases where no seeds were available, the number was inferred from the number of mature capsules present (*A. malaccensis* usually has one seed per capsule although two may occur). Traps were visited until no more flowers, fruits, capsules and seeds were found. The production of flowers, fruits and seeds of a tree (floral load) was estimated using the formula (r/t × n), where r is the canopy area projection, t is the trap area and n is the number of flowers, fruits and seeds trapped. Abortion rate is calculated by subtracting the total production of mature fruits from the floral load.

2.3.4 Pollinator and predator observations

Table 2.3.4.1 shows the date and time of pollinator observations which coincided with the flowering period. Insect visitors were observed and caught using a modified fish net. Only insects which lingered on the flowers were sampled. Samples were obtained from the tower and for tree AM27 samples were also obtained from the ground level. The insects were preserved in 70% ethanol. All specimens were sent to the Entomology Unit in FRIM for identification.

Table 2.3.4.1. Schedule for pollinator sampling at sites S2 and S1.

S2		S1	
Date	**Time**	**Date**	**Time**
26 March 2013	07:00 – 21:00	10 September 2013	21:00 – 11:00
27 March 2013	17:00 – 03:20	11 September 2013	21:00 – 11:00
28 March 2013	17:00 – 02:30	12 September 2013	21:00 – 11:00
1 April 2013	09:00 – 12:00	13 September 2013	09:30 – 17:00
2 April 2013	09:00 – 12:00, 17:00 – 23:00	18 September 2013	09:30 – 18:00
3 April 2013	17:00 – 20:00	19 September 2013	09:30 – 18:00
4 April 2013	02:00 – 06:00	24 September 2013	10:00 – 17:00
5 April 2013	09:30 – 13:00	25 September 2013	10:00 – 13:00
12 April 2013	09:30 – 12:30		

Fruit predation was observed using binoculars, digital camera and standard dissecting tools. Extracted insects from the fruits (if any) were sent to the FRIM Entomology Unit for identification. Seeds collected from the traps were sown in a river sand and soil mixture in the FRIM nursery (23–34ºC, 77–100% humidity). Watering was done using a misting system that operates every 30 minutes. Germination was recorded when the radicle emerged through the seed coat (ISTA 2004).

2.4 Population genetics

2.4.1 Population survey and sample collection

Population survey and sample collection of *A. malaccensis* was conducted (Fig. 2.4.1.1) throughout Peninsular Malaysia. From the 31 forest reserves/forested areas surveyed, samples were collected from 23 forest reserves/forested areas (with sample sizes ≥ 7). Together with samples collected during phase 1 (March 2011 to November 2012; funded by Government of Malaysia), a total of 35 populations consisting of 963 samples were used for microsatellite analysis (Table 2.4.1.1; Fig. 2.4.1.2). However, after carefully checking through the microsatellite data, the total number of samples was reduced from 963 to 942 (averaging 27 samples per population) due to dubious genotypes of certain individuals from Machincang (3), Lubuk Semilang (3), Bukit Malut (9), Gunung Jerai (1), Gunung Inas (1), Solok Duku (1) and Chabang Tongkat (3).

Fig. 2.4.1.1. Population survey and sample collection throughout Peninsular Malaysia. (A) A large *Aquilaria malaccensis* tree in Berkelah, Pahang being measured for dbh and tagged; (B) A large *A. malaccensis* (dbh 77 cm) tree in the forested area of Universiti Teknologi PETRONAS, Perak; (C) Wildings of *A. malaccensis* in the forested area of Mont Kiara, Selangor; (D) Team members during a field trip to Panti, Johor; (E) Harvesting of *gaharu* by *Orang Asli* in Lenggor, Johor; and (F) Extensive damage of an adult tree at Panti due to the slashing of its trunk.

Table 2.4.1.1. Population codes, sample sizes (*N*) and state of origin of 35 populations of *Aquilaria malaccensis* included in the study. *Values in parentheses are the final sample size used for microsatellite analysis.

Population	Code	*N*	State of origin
1. Machincang	MAC	23 (20)*	Kedah
2. Lubuk Semilang	LSE	20 (17)*	Kedah
3. Bukit Malut	BMA	30 (21)*	Kedah
4. Bukit Perangin	BPE	34	Kedah
5. Gunung Jerai	GJE	17 (16)*	Kedah
6. Gunung Inas	GIN	12 (11)*	Kedah
7. Gunung Bongsu	GBO	16	Kedah
8. Penang National Park	PEN	25	Pulau Pinang
9. Bukit Kerajaan	BKE	54	Pulau Pinang
10. Gunung Semanggol	GSE	32	Perak
11. Bubu	BUB	23	Perak
12. Kledang Saiong	KSA	7	Perak
13. Universiti Teknologi Petronas	UTP	34	Perak
14. Bukit Tapah	BTA	37	Perak
15. Bukit Lagong	BLA	35	Selangor
16. Mont Kiara	MKI	40	Selangor
17. Pelangai	PEL	9	Negeri Sembilan
18. Pasir Panjang	PPA	20	Negeri Sembilan
19. Solok Duku	SDU	40 (39)*	Melaka
20. Sungai Udang	SUD	59	Melaka
21. Paya Rumput	PRU	36	Melaka
22. Maokil	MAO	28	Johor
23. Panti	PAN	61	Johor
24. Lenggor	LEG	12	Johor
25. Lentang	LEN	7	Pahang
26. Som	SOM	16	Pahang
27. Tekai-Tembeling	TTE	20	Pahang
28. Berkelah	BEK	24	Pahang
29. Beserah	BES	25	Pahang
30. Merchang	MER	34	Terengganu
31. Gunung Tebu	GTE	31	Terengganu
32. Chabang Tongkat	CTO	53 (50)*	Kelantan
33. Jeli	JEL	11	Kelantan
34. Nenggiri	NEN	17	Kelantan
35. Batu Papan	BPA	21	Kelantan

The samples were collected in the form of inner bark or leaf tissues. For inner bark sampling, a small piece of inner bark measuring 10 × 10 cm was cut from each identified tree and the wound then sprayed with paint to prevent infection. As for leaf sampling, the ‘shaking-catch’ method described by Ng (2005) was employed for large trees. In this method, a fishing weight attached to nylon fishing string was shot up using a catapult and looped over a small branch. A bigger and stronger rope was then hauled up to replace the fishing string. The two ends of the rope were then pulled vigorously together to break a small branch. The collected samples were immediately processed in the field and kept in silica gel, or wrapped with aluminum foil, and kept in liquid nitrogen.

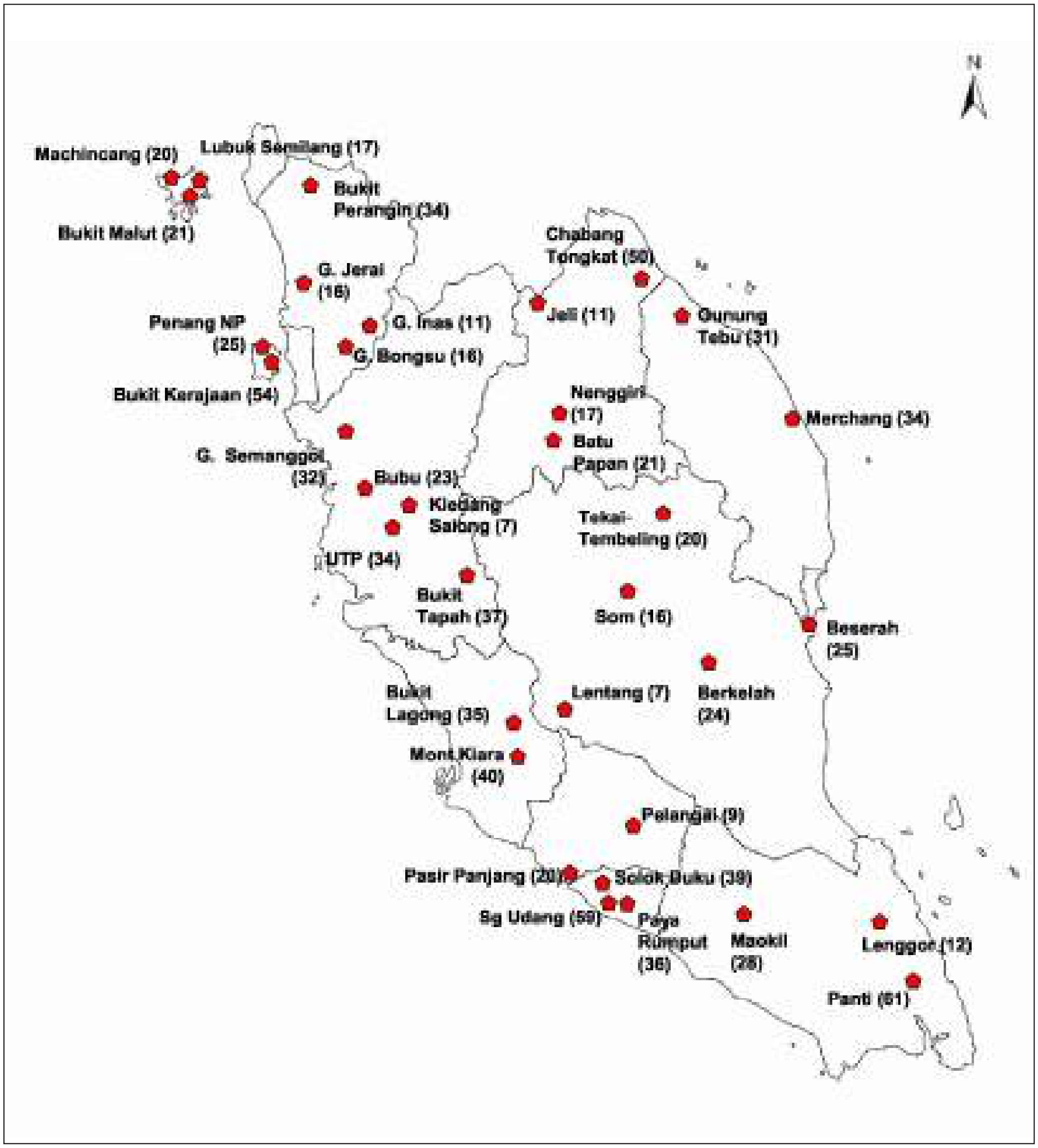


Fig. 2.4.1.2. Locations of the 35 populations of *Aquilaria malaccensis* in Peninsular Malaysia included in the study. Values in parentheses are the final sample size used in the study.

2.4.2 DNA extraction and purification

Genomic DNA was extracted using the CTAB method described by Murray and Thompson (1980) with modification. The method was slightly modified by 2X CTAB extraction buffer to accommodate the tissue to buffer ratios. Approximately 3–5 g of fresh leaf or inner bark tissue was placed in a mixer-cup with liquid nitrogen and homogenized into fine powder using Miller IFM-150 homogenizer (Iwatani). The fine power was then transferred into a 50-ml tube and mixed with 20 ml pre-heated (65ºC) 2X CTAB extraction buffer (2% [w/v] CTAB, 20 mM EDTA, 100 mM Tris-HCl [pH8.0], 1.4 M NaCl, 1.5% [v/v] mercaptoethanol and 1% [w/v] PVP-40, with final pH 8.0) to form a homogenous slurry. The slurry was incubated at 65ºC for 30 min with occasional mixing and then left to cool to ambient temperature. Subsequently, an equal volume of chloroform-isoamyl alcohol (24:1) was added and mixed gently for 15 min and then centrifuged at 2700 rpm for 10 min to remove proteins and carbohydrates. The supernatant (top phase) was transferred to a new 50-ml tube and the DNA was precipitated with two-third volume of cold isopropanol (-20ºC).

The CTAB-nucleic acid complex was spooled out with a glass rod (for particulate precipitates, the tubes were spun at 2700 rpm for 10 min), transferred into a 1.5-ml tube containing 1 ml of wash buffer (76% ethanol and 10 mM NH_4OAc) and left for at least 1 h at 4ºC in order to dissolve the CTAB from CTAB-nucleic acid complex. The tubes were subsequently centrifuged at 12000 rpm for 10 min (4ºC). Then the supernatant was carefully discarded and the pellet was vacuum-dried for 20 min. After drying, the pellet was dissolved in 0.5–1.0 ml of TE buffer (10 mM Tris-HCl pH 8.0 and 1 mM EDTA). The final solution should contain a combination of RNA, nuclear DNA, chloroplast DNA and mitochondrial DNA.

The DNA quality and quantity were determined on a 0.85% agarose gel containing 0.5 µg/ml of ethidium bromide (Fig. 2.4.2.1). Electrophoresis was carried out with 1X TAE buffer (40 mM Tris-acetate pH 8.0, 1 mM EDTA) and calf thymus concentration markers (Boehringer Mannheim) were used as standard for comparison. Purification of the genomic DNA was carried out using the High Pure PCR Template Preparation Kit (Roche Diagnostics GmbH) following the manufacturer's instructions. Finally, the quantity and purity of the DNA were further quantified using NanoDrop 2000 Spectrophotometer (Thermo Scientific).

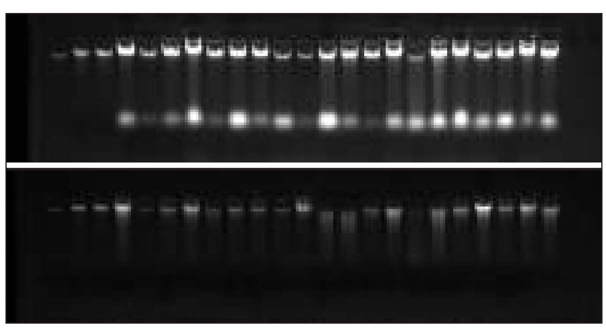


Fig. 2.4.2.1. Gel result obtained before (above) and after (below) purification of the genomic DNA. The first three lanes from the left indicate calf thymus marker of concentration 10, 25 and 50 ng/µl.

2.4.3 Multiplex-polymerase chain reaction amplification

Multiplex–PCR amplification was used to verify the suitability of the 17 pairs of microsatellite primers *Ama*025, *Ama*040, *Ama*053, *Ama*057, *Ama*067, *Ama*101, *Ama*114, *Ama*115, *Ama*131, *Ama*144, *Ama*177, *Ama*211, *Ama*233, *Ama*263, *Ama*264, *Ama*331, *Ama*338 (Tnah *et al*. 2012) developed for *A. malaccensis.* The multiplex PCR amplification was carried out using TYPE-IT MICROSATELLITE-PCR KIT (Qiagen) following the manufacturer's protocol with modification. The multiplex-PCR amplifications were performed in 8 µl reaction mixture, with 5 ng template DNA, 1X TYPE-IT MULTIPLEX PCR MASTER MIX, and 0.05 µM of each primer. Optimal amplification conditions were 1 cycle of 3 min at 94ºC, followed by 35 cycles of 94ºC (30 s), 50ºC–57ºC (30 s), and 72ºC (30 s), and final step of 30 min at 72ºC using 2720 THERMAL CYCLER (Applied Biosystems). For genotyping, the PCR products were subjected to fragment analysis using ABI 3130*xl* GENETIC ANALYZER (Applied Biosystems) with ROX 400 as internal size standard. Individuals were genotyped using GENE MAPPER v4.0 (Applied Biosystems).

After the multiplex-PCR screening, out of the 17 loci, five were dropped from further analysis, due to stuttering (*Ama*067 and *Ama*211) and non-specific amplification (*Ama233, Ama263* and *Ama264*). The remaining 12 loci were assigned to three sets of primer combinations for multiplex-PCR amplification, based on the product size range and the type of fluorescently labelled dye (Tables 2.4.3.1 & 2.4.3.2). The fluorescently labelled and unlabelled forward primers were optimized in ratios of 1:1 to 1:9 depending on allele peak intensity.

2.4.4 Statistical analyses

2.4.4.1 Genetic diversity within and among populations

The allele frequency, allelic richness (R_s), private alleles, average number of alleles per locus (A_a), observed (H_o) and expected heterozygosity (H_e) (Nei 1987) were computed using the program FSTAT V2.9.3.2 (Goudet 2002) and GDA V1.1 (Lewis & Zaykin 2002). Allelic richness was measured by the method of El Mousadik and Petit (1996) using rare-fraction approach whereby the allelic richness was standardized to that of the smallest sample size over populations and over loci. The number of rare alleles (frequency of less than 5% in the population; Marshall & Brown 1975) per individual in each population was also calculated.

Fisher exact test for Hardy-Weinberg and linkage disequilibrium were performed using GDA V1.1. A Bonferroni correction was then used to compensate for multiple comparisons between loci (Rice 1989). Wright's (1951) *F*-statistics was calculated to measure the deviation of Hardy-Weinberg equilibrium at each locus in each population. Weir and Cockerham's (1984) estimates of the inbreeding coefficient or fixation indices ($F_{IS} = 1 – H_o/H_e$) for each population across each locus were computed using FSTAT V2.9.3.2 and the average value for each locus determined. The significance of the F_{IS} values ($F_{IS} \neq 0$) was determined based on 1000 randomizations with standard Bonferroni correction.

Genetic structure was assessed using the infinite allele model (IAM; Kimura & Crow 1964). The population differentiation coefficients, Weir and Cockerham's (1984) estimates of Wright's F_{ST} (θ, Wright 1951, 1977) were calculated using FSTAT V2.9.3.2.

Table 2.4.3.1. Characteristics of 12 polymorphic microsatellite markers of *Aquilaria malaccensis* developed by Tnah *et al*. (2012). Annealing temperatures (T_a) and expected numbers of alleles (*A*).

No.	Locus	GenBank accession	Repeat	Primer sequence (5' - 3')	T_a (ºC)	Allele size range (bp)
1.	*Ama*025	JQ845077	$(CT)_{20}$	F: ATGAATGAAACCCAATGAA R: ATTTCCTTTATTGCTGGTTC	45	85-128
2.	*Ama*040	JQ845078	$(GA)_{22}$	F: CACGACAAAGAAAACATACA R: AACCTCATCCCGTCCTCGCA	45	96-122
3.	*Ama*053	JQ845079	$(GT)_8(GA)_{15}$	F: GGGAGAGAGAGAGAAAAG R: CTGCTGTTCAACGAGTTCT	45	147-178
4.	*Ama*057	JQ845080	$(AC)_6$-$(AC)_9$	F: CACATACATAGACACGC R: GCAATACAATACAATGAAG	45	98-113
5.	*Ama*101	JQ845082	$(AC)_6$	F: GCTTAGACAGGCAATATCCAT R: GAGAAAACGGCAAAAG	45	157-159
6.	*Ama*114	JQ845083	$(AC)_{13}$	F: TGCCCTCTCTCAAGTTATT R: AAGCATATAATAAGAATCC	45	178-192
7.	*Ama*115	JQ845084	$(GT)_9$	F: TCCCATCAGAAGCCCCTC R: ACAACCATAAATGCTAC	45	92-101
8.	*Ama*131	JQ845085	$(AC)_{12}$	F: GGTCTTGAGCTGGAATGAG R: TCGATGACGGATAGCAG	45	169-187
9.	*Ama*144	JQ845086	$(AC)_{13}$	F: GAACGCAATGCAATATCT R: GGTGATGATATGTCGCTTC	45	205-220
10.	*Ama*177	JQ845087	$(CT)_{18}$	F: GGACCACTGCTGCATTTAA R: TGGCAAGATGGACAAGCAG	45	256-294
11.	*Ama*331	JQ845092	$(AC)_{10}$	F: TGTGATGACTGTGAGAAG R: CATCTGTTGTTCCTTTTG	62	108-118
12.	*Ama*338	JQ845093	$(AC)_6$	F: ATATATGCCACCTACCTA R: CCACGACGTAGACTCAA	50	128-141

Table 2.4.3.2. Three sets of primer combinations assigned for multiplex-PCR amplification, based on the product size ranges and types of fluorescently labelled dye with expected numbers of alleles (*A*) and annealing temperatures (T_a). The fluorescently labelled and unlabelled forward primers were optimized in a ratio of 1:1 or 1:9.

Set	Locus	Fluorescent dye	F-Primer ratio	Size range (bp)	*A*	T_a (°C)
Set1	*Ama*025	HEX	1:1	81-137	27	50
	*Ama*131	6-FAM	1:10	171-189	10	50
	*Ama*144	HEX	1:2	207-233	7	50
	*Ama*177	6-FAM	1:9	270-308	19	50
	*Ama*338	6-FAM	1:10	132-140	4	50
Set2	*Ama*040	HEX	1:9	94-136	21	50
	*Ama*114	6-FAM	1:2	176-202	12	50
	*Ama*331	6-FAM	1:9	106-120	9	50
Set3	*Ama*053	HEX	1:9	146-184	21	50
	*Ama*057	6-FAM	1:9	101-115	8	50
	*Ama*101	6-FAM	1:3	155-159	3	50
	*Ama*115	HEX	1:9	93-103	4	50

For the analysis of isolation-by-distance, Mantel tests (Mantel 1967) were carried out between the matrices of genetic differentiation (F_{ST}) and geographical distances using GENALEX 6.1 (Peakall & Smouse 2007). The geographical distances between populations were calculated from the respective latitudes and longitudes using the same software. The association between the two types of distances was tested for significance by 999 permutations.

2.4.4.2 Relationship among populations

Three approaches were used to determine the relationship among the populations: (1) cluster analysis based on D_A genetic distances; (2) principal component analysis (PCA); and (3) Bayesian approach to deduce population structure.

Cluster analysis based on D_A genetic distances (Nei *et al*. 1983) was used because of its independence of the mutation models (Nei 1987) and superior to other distance measures in correct tree topology construction using microsatellites (Takezaki & Nei 1996). D_A between all pairs of populations was estimated using POWERMARKER V3.25 (Liu & Muse 2005) and the average distance was estimated across all loci. Consequently, a dendrogram was constructed by Neighbour-Joining (NJ) method (Saitou & Nei 1987) using the same software, viewed under MEGA V4.0 (Tamura *et al*. 2007). Branch node support was estimated by resampling over loci with 1000 bootstraps.

PCAs were computed to view pairwise differentiation among populations (F_{ST}) using the programme PCAGEN v1.2.1 (Goudet 1999). Estimations were based on the correlation matrix of population allele frequency where three different analyses were performed:

PCA1: On all the 35 *A. malaccensis* populations.
PCA2: On the 14 populations from Cluster Kedah-Perak.
PCA3: On the 21 populations from Cluster Kelantan-Johor.

For each analysis, two-dimensional standard plots were produced representing the first three principal components. The significance of axes for each PCA was estimated by 1000 randomizations.

Unlike the preceding analyses which are based on predefined populations, the Bayesian-clustering method of Pritchard *et al*. (2000) detects genetic structure without prior information on the number of locations from which the populations were sampled. The software STRUCTURE v2.3.3 (Pritchard *et al*. 2000, Falush *et al*. 2003) and STRUCTURE HARVESTER v0.6 (Earl & VonHoldt 2011) were used to evaluate the optimal number of clusters (*K*), and assign each of the 942 individuals of *A. malaccensis* to a population without the predefined population information. In the analysis, loci were assumed to be independent with complete Hardy-Weinberg equilibrium within the population. A Markov Chain Monte Carlo (MCMC) algorithm was used to compute the allele frequencies in each of the *K* regions. Initially, 35 independent runs were performed for all populations with simulations of 50,000 burn-in periods, 20 iterations and 100,000 MCMC. Similar parameters were used for *K* = 1–14 for the populations on Cluster Kedah-Perak and *K* = 1–21 for the populations on Cluster Kelantan-Johor. After the STRUCTURE analyses, the 942 individuals of *A. malaccensis* were subsequently assigned to their respective populations when the best *K* value was elucidated and individual admixture proportions were sorted.

2.4.4.3 Optimum population size

The optimum population size to maintain the current level of genetic diversity was estimated according to Lee *et al*. (2002). The genotype data from all studied populations were pooled (total number of samples was 942) for simulation analysis. To determine the optimum population size required for maintaining the total number of alleles (A_t), 930 out of 942 samples were sampled without replacement 1000 times using a computerized algorithm. The A_t was calculated. The A_t was also estimated for sample sizes of 930 to 10, with a 10-sample reduction interval. The percentage means A_t with standard errors were plotted against sample sizes to reveal trends.

2.5 Non-detriment findings (NDF)

From the data on demography, reproductive ecology and genetic components, the partial NDF for *A. malaccensis* was developed.

3.1 *Spatial pattern*

The population at S6 shows no specific association with topography or soils (Fig. 3.1.1A). It is spatially random up to a distance of 20 m, beyond which it becomes regularly spaced as evidenced by a weak but statistically significant deviation. At distances greater than 45 m, the pattern returns to randomness. There is no evidence of clustering (Fig. 3.1.1B). The pattern for mature individuals is random for all distances up to 100 m (Figs. 3.1.1C & 3.1.1D). There appears to be no shift in the spatial pattern since 1987 (Manokaran *et al*. 1992, LaFrankie 1994). The absence of aggregation at all distances suggests that density-dependent mortality continued steadily to alter the spatial pattern towards a regular distribution.

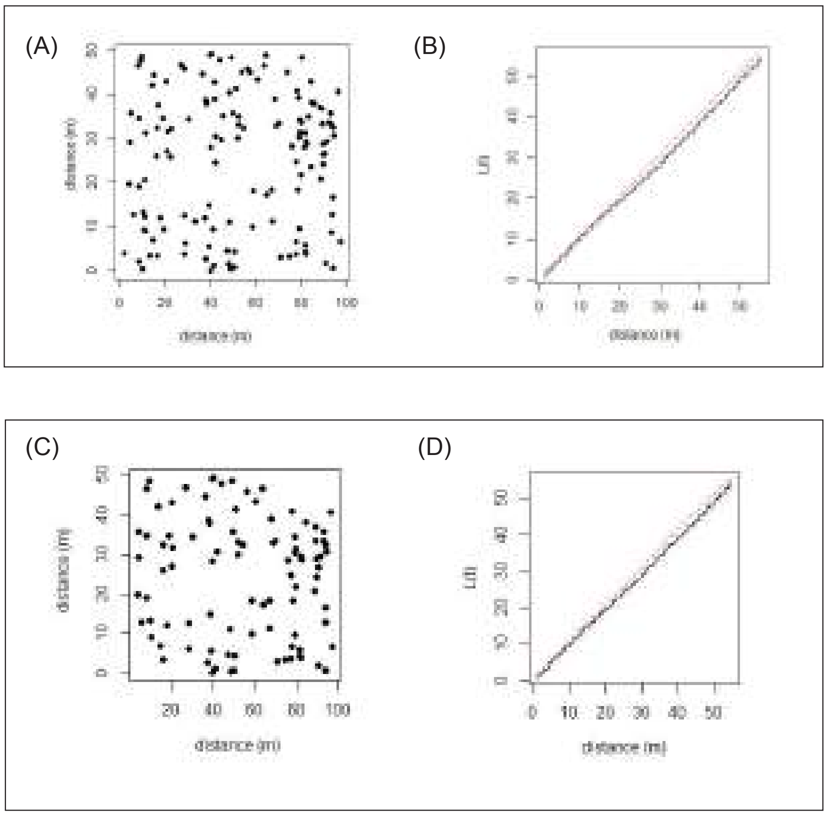


Fig. 3.1.1. Spatial distribution and L(t) plots for *Aquilaria malaccensis* at S6 Census6. (A) Distribution for all 142 trees. (B) Plot of L(t) vs. distance up to 100 m for all trees. Dashed lines are 0.025 and 0.975 quantiles of L(t) estimated from 100 simulations. (C) Distribution for 95 mature trees with dbh>145 mm. (D) Plot of L(t) vs. distance up to 100 m for mature trees. Line description is the same as in (B).

3.2 Demography

3.2.1 Growth, recruitment and mortality

The mean annual dbh growth rate for the S6 population over the 23-year period was 3.3 ± 2.49 mm/year. Table 3.2.1.1 and Fig. 3.2.1.1 provide the mean annual dbh increment between two consecutive censuses for the same period. The rate of diameter growth showed an almost linear increment across all categories with the smallest dbh category consistently having the lowest rates while the largest category had the highest rates (Fig. 3.2.1.2). The mean annual dbh growth rate generally (with a single exception) decreased with time in all dbh categories - the growth of smaller juveniles (10−100 mm) continues to fall as years passed by; this trend is however somewhat reversed in the 100−200 mm dbh category. *Aquilaria malaccensis*, across all dbh sizes, had a consistently higher growth rate when compared to *Gonystylus maingayi*, a member of the same family (Fig. 3.2.1.2). Increment rates between dbh categories are also higher in *A. malaccensis*.

Table 3.2.1.1. Mean annual rate of diameter growth, mortality, recruitment and change in abundance of *Aquilaria malaccensis* between consecutive censuses in S6.

Btw census	Abundance		Growth		Mortality		Recruitment		Population change	
	N1	N2	N	Rate	Died	Rate	Recruits	Rate	interval	Little r
C12	125	124	117	3.732251	5	0.01431782	4	0.01143128	2.868376	-0.00280025
C23	124	122	110	2.97556	11	0.01670426	9	0.01385057	5.570168	-0.002919216
C34	122	118	107	3.092607	4	0.006969114	3	0.00538864	4.783452	-0.006969114
C45	118	114	103	3.212163	5	0.009273046	4	0.007785603	4.665735	-0.007391371
C56	114	104	91	3.479425	13	0.02261291	5	0.009335401	5.355447	-0.01714284

Note: C12: denotes years between census1 and census2, the same applies to other notations. Census 1 took place in 1987; N1: abundance in the first census; N2: abundance in the subsequent census; interval: time interval in years; little r: the rate of population change given by (log(N2)-log(N1))/time.

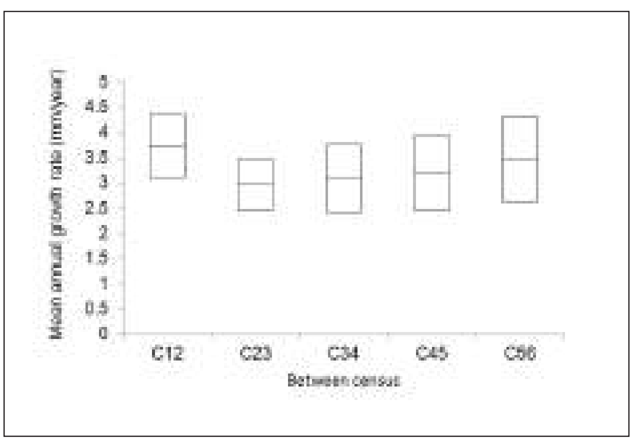


Fig. 3.2.1.1. Mean annual dbh increment rates for *Aquilaria malaccensis* population in S6. In each bar, the mid line is the mean while the upper and lower lines reflect the 95% confidence interval.

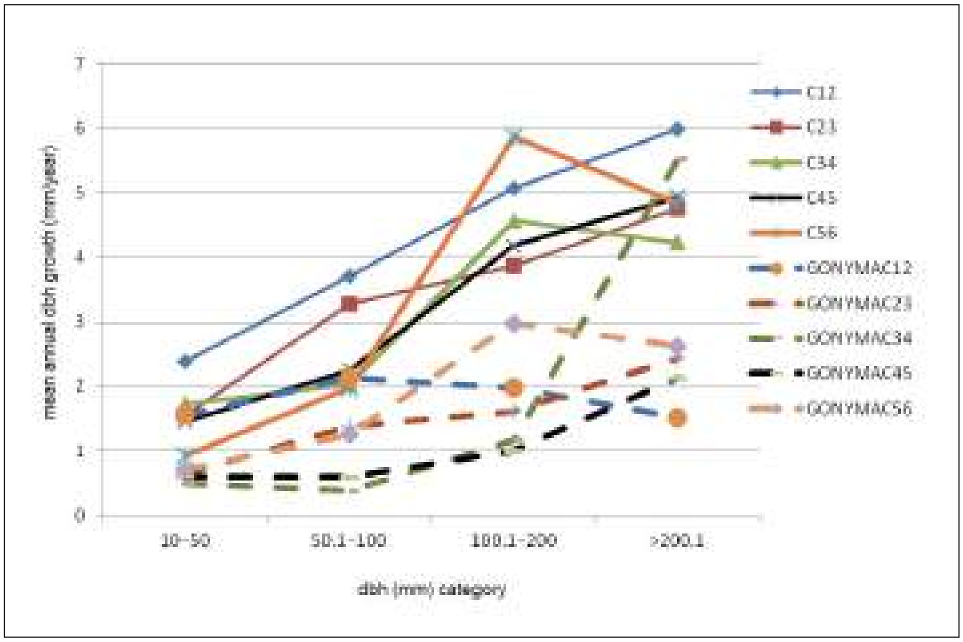


Fig. 3.2.1.2. Mean annual dbh growth (mm/year) between dbh categories for *Aquilaria malaccensis* and *Gonystylus maingayi*. Note that the large increase seen in GONYMAC34 could be partly due to the very large statistical error in that dataframe. GONYMA in all censuses has less than 6 individuals in the largest dbh category available for analysis.

The rate of population change, calculated on the basis of abundance, has been on a decline since 1987 (Fig. 3.2.1.3). The lowest rate was seen between Census 5 (2005) and 6 (2010) and this was due to a mortality rate that had more than doubled from the previous census (Table 3.2.1.1, Fig. 3.2.1.4). Since 1987, the mean annual mortality rate has been consistently higher than the recruitment rate in the population. Rates for mortality and recruitment fluctuated during the 23-year period but generally both appeared to show a similar trend (Fig. 3.2.1.5). Mortality was highest in the small-sized class (Fig. 3.2.1.6) while remaining stable in the mid-sized class but decreased in the largest size class. This explains why the abundance of smaller dbh trees had dropped since 1987 (Fig. 3.2.1.7). These combined factors have led to a decline in the rate of population change. Soehartono & Newton (2001a) indicated that populations under study in West and East Kalimantan were likely to increase in the future in the absence of disturbance but results here show otherwise. This may be due to the short period of assessment and limited sample sizes used in their assessment.

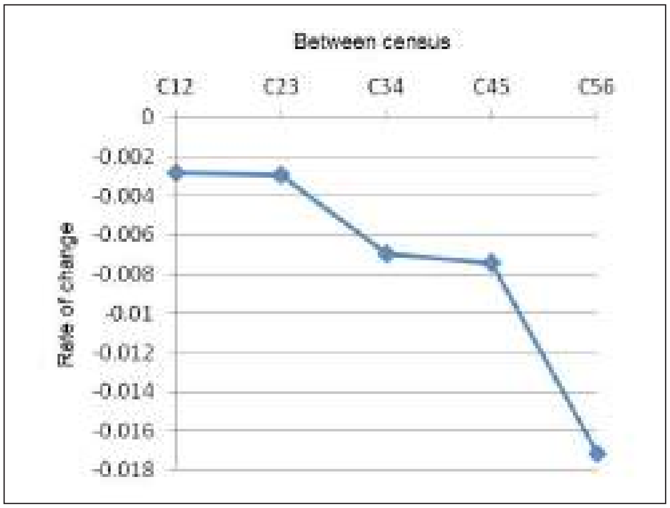


Fig.3.2.1.3. Rate of *Aquilaria malaccensis* population change between censuses at S6.

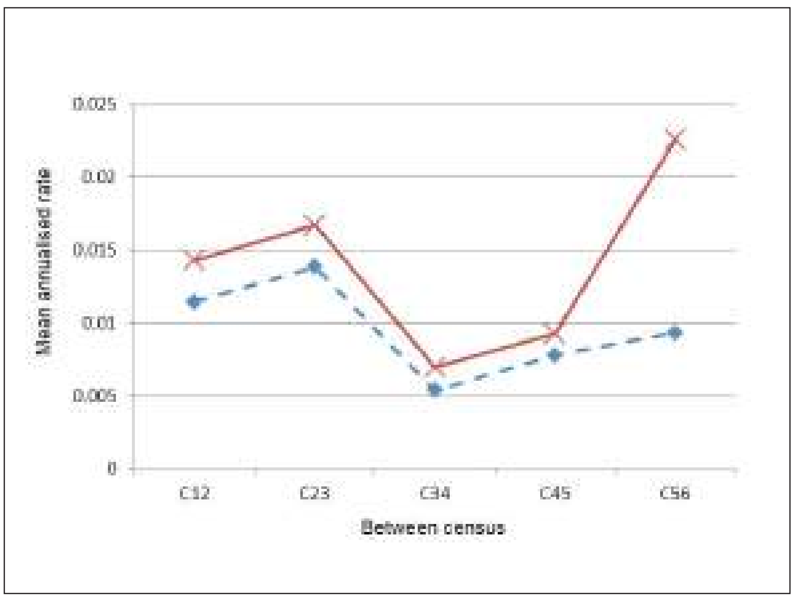


Fig. 3.2.1.4. Mean annual recruitment and mortality rates of *Aquilaria malaccensis* in S6. Solid and dashed lines indicate mortality and recruitment respectively.

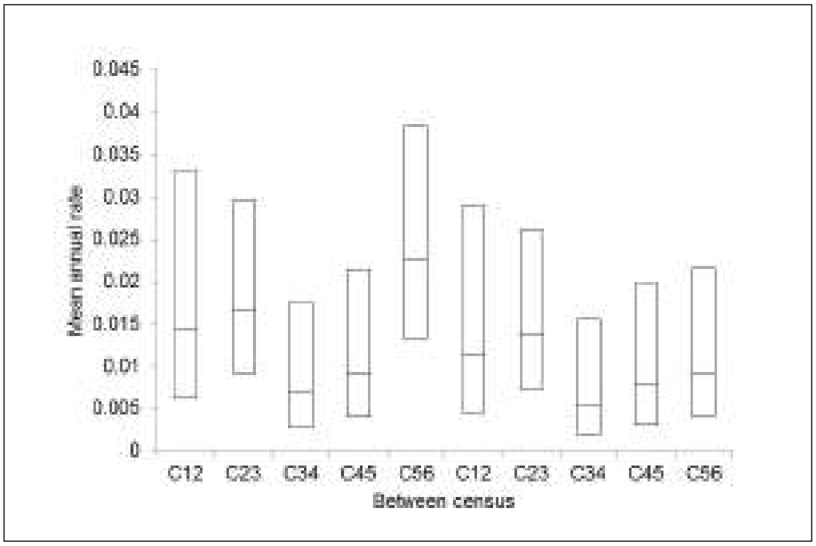


Fig. 3.2.1.5. Mean annual mortality and recruitment rates for *Aquilaria malaccensis* population in S6. The line in the bar is the mean. The left 5 bars indicate mortality, the remaining 5 are for recruitment. Y axis applies to both mortality rate (number of dead stems/year) and recruitment rate (no. of recruits/ year).

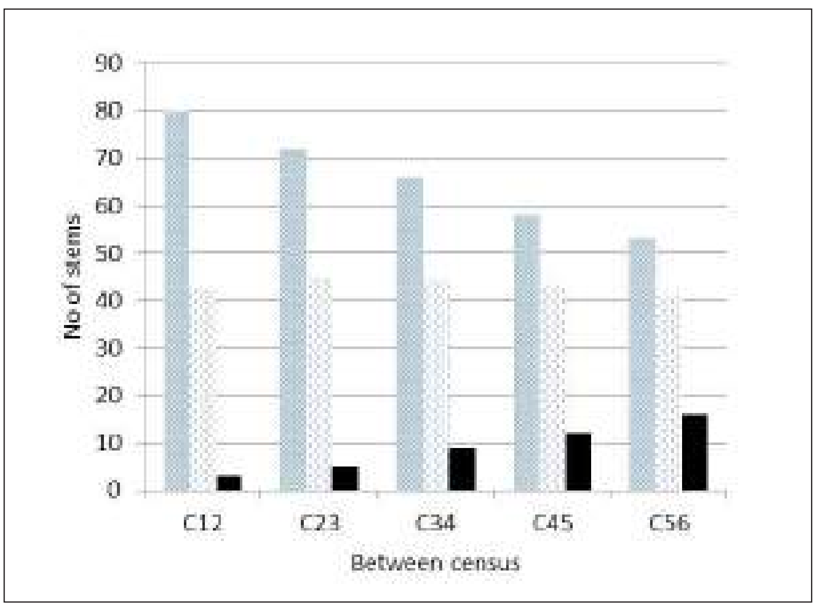


Fig. 3.2.1.6. Change in the abundance of *Aquilaria malaccensis* trees by dbh category in S6 from 1987 to 2010. Closed bars, well-spaced dotted bars and solid bars indicate 10–99 mm, 100–299 mm and greater than 300 mm dbh category.

Fig. 3.2.1.7. shows the frequency of the dbh distribution of the S6 population in 1987 (A, B) and 2010 (C, D). Both distributions have the inverse-J curve and the distribution in 2010 has become flatter compared to that in 1987.

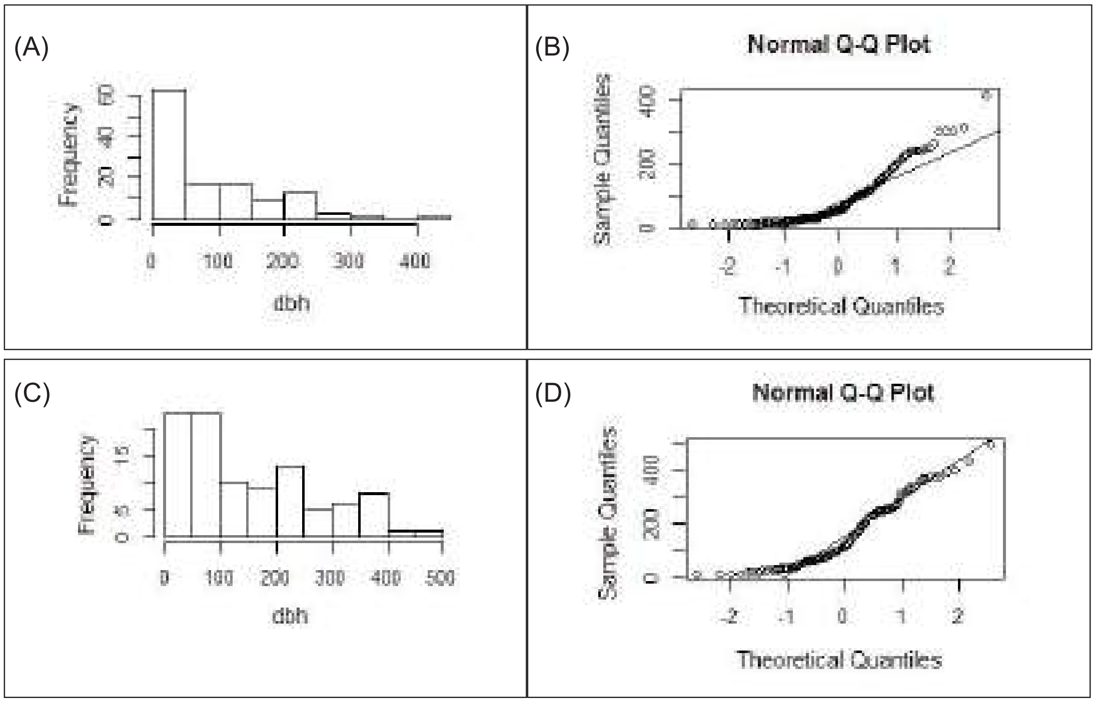


Fig. 3.2.1.7. Frequency distribution and departure from normality for S6 *Aquilaria malaccensis* population in 1987 (A, B) and 2010 (C, D).

Demographic information from growth, recruitment and mortality in S6 projects that the future population change of *A. malaccensis* will continue to decline. The lower recruitment rate and the higher growth rate exhibited by larger individuals partly explain the shift to a flatter distribution curve between 1987 and 2010. Also, future population change would be influenced more by the growth rate of larger trees compared to smaller juveniles and therefore harvest of larger trees could potentially result in a steeper decline. The inter-annual variability in recruitment and mortality rates is also expected to persist, following predictions by Metz *et al*. (2008) as the species is supra-annual (see section 3.3). Condit *et al*. (1998) speculated that juvenile growth would be the strongest predictor of size distribution but this is not reflected in the S6 population. This non-conformity is not unexpected given the large inter-specific variations in life history traits and strategies of the species covered in their study, and the interaction with the highly heterogenous physical environment (see also King *et al*. 2006).

The low growth rate in the smallest dbh category implies that juveniles are likely to stay in this category for a longer period of time. Because of this longer period, their survival strategies remain limited and they become more vulnerable to predation and environmental stochastic processes (Green *et al*. 2015).

3.2.2 Abundance

Fig. 3.2.2.1 shows the stocking of *A. malaccensis* and *A. hirta* in the natural forests based on their AOO. The greatest loss took place between the years 1993 and 2004; in 2004 the genus was listed in the CITES Appendix II. Using the reproductive threshold dbh of 145 mm established by this study, there was a potential loss of 89% of mature individuals in its geographical range in the peninsula between those years. This partly explains the drastic decline in recruitment into the higher size classes and hence the sharp drop in all size classes registered in the intervening years between 1993−2004. There is no significant change in the frequency of the 2013 size class distribution; in this inventory, no trees above 55 cm dbh were recorded in the sample plots. Additionally, the characteristic decreasing exponential curve associated with a thriving tropical plant population that was present in 1993 had become linear. This result corroborates the result from S6. A point of caution to be noted here is that bearing in mind that *karas* has a regular distribution, this apparent decline could have been influenced by the size and location of the plots that did not capture an adequate representation of the existing *karas* populations.

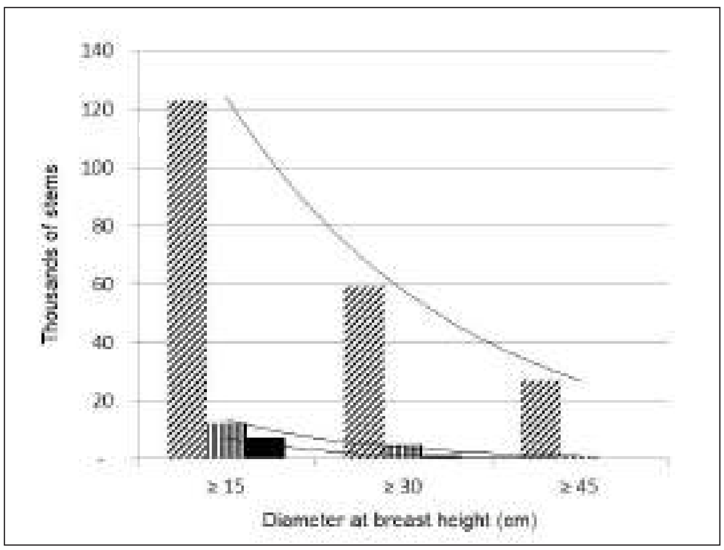


Fig. 3.2.2.1. Stocking of *Aquilaria malaccensis* and *A. hirta* in 1993, 2004 and 2013 in Permanent Reserved Forests in Peninsular Malaysia based on AOO. Slash, vertical and solid bars indicate 1993, 2004 and 2013 stocking respectively.

The IHN5 results suggest that the distribution of mature trees must now be more scattered than previously recorded. Many merchantable trees may already have been injured if not lost by now. Although harvesters traditionally do not target smaller diameter trees as they perceive that the amount of impregnated wood would be too small, the lucrative demand has begun to push this self-imposed threshold size even lower. In fact, this has been reported as far back as 2000 by Barden *et al*. (2000) and at the local scale, there has been abundant evidence of harvest of smaller trees (foresters and rangers from various state Forest Departments, Jutta, M. & Lee, S.L., pers. comm.). The notion that low density and scattered distribution are a hindrance to collection efforts (LaFrankie 1994) was dispelled during communication exchanges with collectors (Mohd. Noor, pers. comm.). Indiscriminate harvesting is aided by forest fragmentation which increases accessibility and opportunities for harvesting. The ability of younger individuals to reproduce early and to produce more seeds (Soehartono & Newton 2001b) is insufficient to offset the negative impacts of indiscriminate harvesting. In face of harvesting pressure, every tree is likely to have a very short reproductive lifecycle.

3.3 Flowering phenology

Aquilaria malaccensis populations in Perak and Penang Island flowered annually during the period 2011 to 2015. The flowering intensity however varied between years and sites. During this period, masting in these states occurred once, in 2014 (Fig. 3.3.1) (Lau 2015). Generally, flowering and fruiting episodes occurred earlier in the Penang populations, i.e., between February/March to June/July while flowering took place later in August/September to December/January in Perak. In the 2014 masting year however, populations in both states flowered simultaneously. *Aquilaria malaccensis* clearly exhibits a supra-annual flowering behaviour.

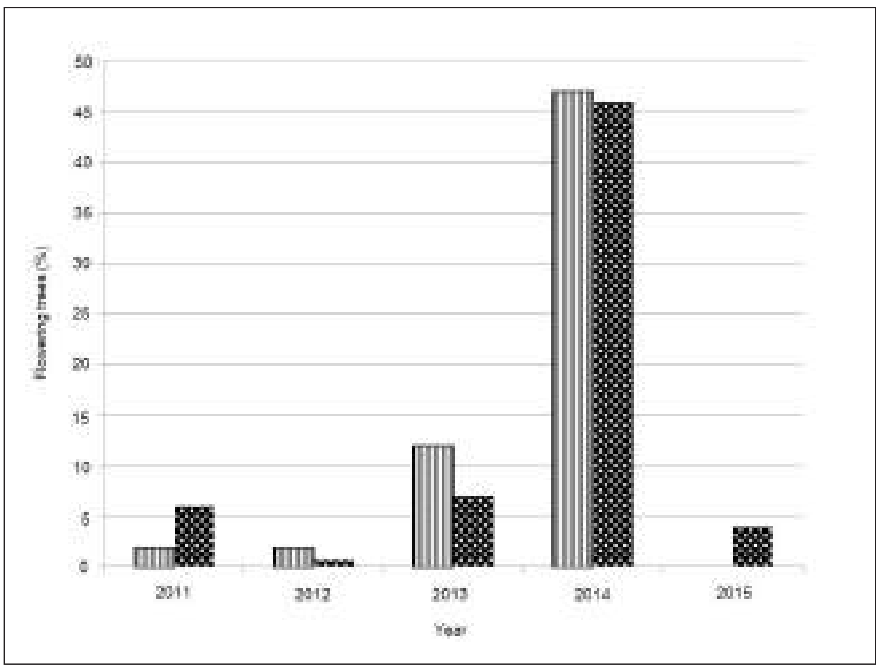
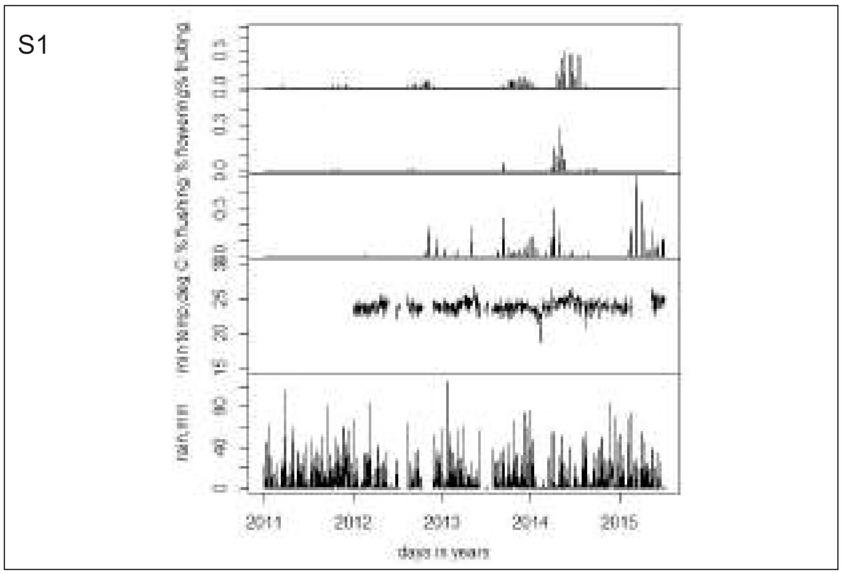
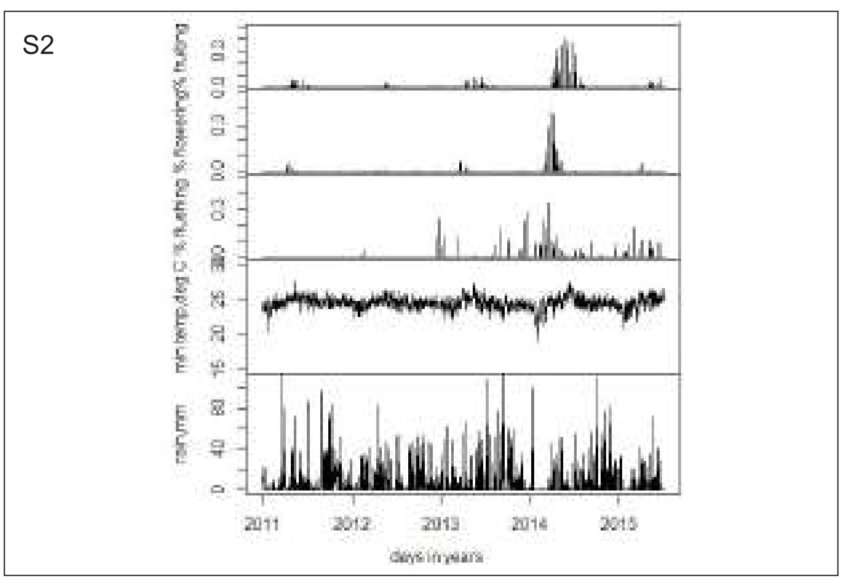
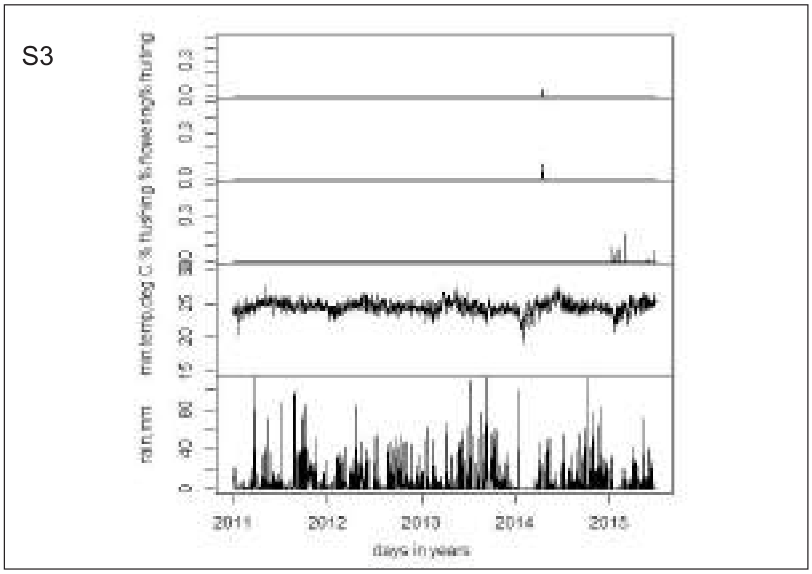


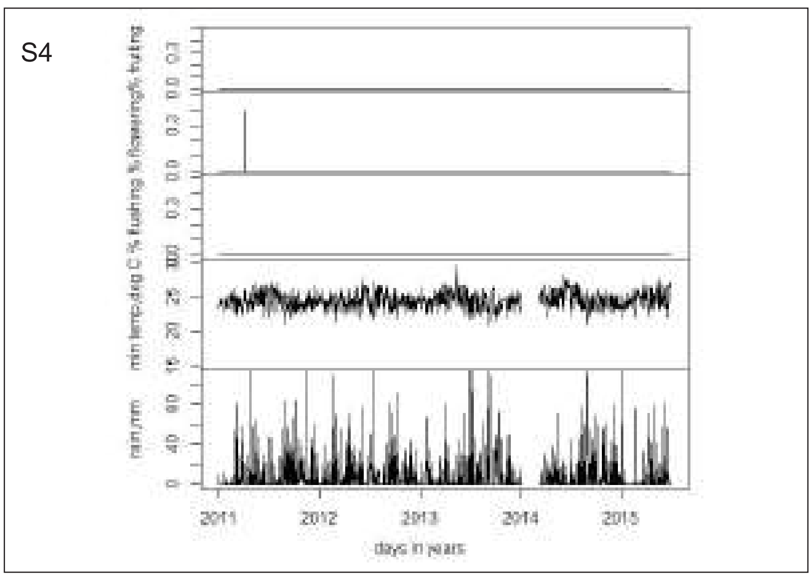
Fig. 3.3.1. Flowering intensity in the observed *Aquilaria malaccensis* populations during the period 2011 to 2015. Vertical and dotted bars indicate Perak and Penang Island respectively

The masting event in the S1 population (beginning 21 March 2014) occurred after a distinct drop in minimum temperature two months before (23 January) and in S2 populations (25 February 2014) after a similar distinct drop one month before (21 January); both temperature drops occurred during a short spell of drought (Fig. 3.3.2). Populations in S3, S4 and S5 however did not respond similarly and this may be due to the smaller number of samples observed. Not all occurrences of a distinct drop in minimum temperature during a drought produced masting, for example, such an event that happened in S2 in early 2011 did not produce a masting event there. Beginning 2013 flushing occurred regularly in S1 and S2. The masting event of 2014, as well as other sporadic flowering events also coincided with the flushing events at these sites (Fig. 3.3.2). It appears that flowering may coincide with leaf flush, hence leaf flushing may be used as an indicator of flowering. Flushes may occur with or without senescence of the older foliage.






S3
% fruiting
% flowering
% flushing
min temp,deg C
rain,mm
2011
2012
2013
2014
2015
days in years


S4
% fruiting
% flowering
% flushing
min temp,deg C
rain,mm
2011
2012
2013
2014
2015
days in years

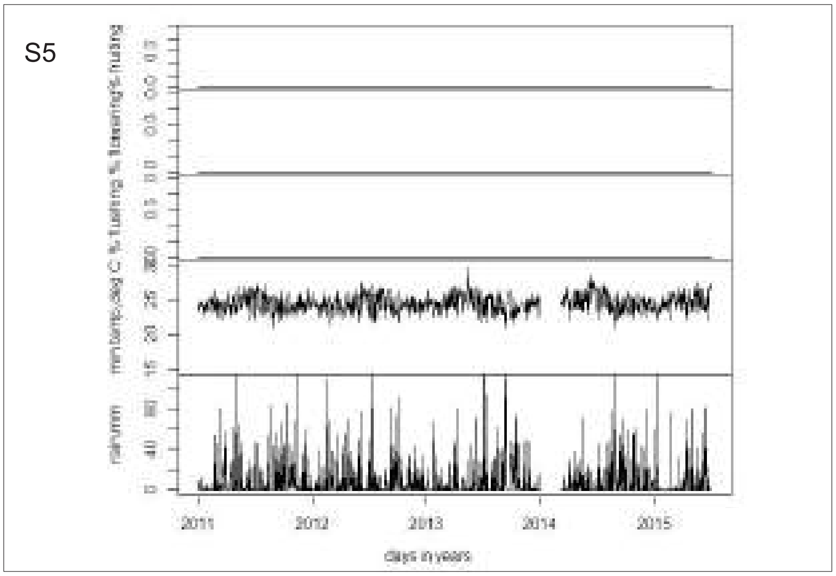


Fig. 3.3.2. Flushing, flowering and fruiting phenology of the *Aquilaria malaccensis* populations in relation to daily rainfall and minimum temperature at the five sites, S1–S5.

3.4 Floral and fruit biology

The complete reproductive cycle from flower initiation to mature fruit fall usually lasts up to four months with flowering lasting about two months. In an inflorescence, the duration from budding to first flower opening is between one to two weeks. The complete reproductive cycle from flower initiation to mature fruit fall usually lasts up to four months with flowering lasting about two months. In an inflorescence, the duration from budding to first flower opening is between one to two weeks. The inflorescences of *A. malaccensis* are axillary, supra-axillary or terminal, sometimes borne at internodes and can be sessile or short-peduncled (Fig. 3.4.1A, B). Each inflorescence bears between 10 and 20 flowers. Flowers are campanulate, green to dirty yellow, 5-6 mm long, hermaphroditic, pedicelled, filaments short or filiform, stigma distinct, globose, capitate, pyramidal or oblong (Fig. 3.4.1C). Bud development takes about one week. The flower usually opens in the late evening between 3.00–7.00 pm. On average, a flower takes about 40 minutes to fully open (Fig. 3.4.1D). The anther is already at anthesis upon opening (Fig. 3.4.1E). Approximately two hours later, the stigma becomes receptive and this lasts for about 16 hours providing plenty of opportunity for pollen arrival. Anthers turn dark, indicating end of viability, approximately 24 hours later (Fig. 3.4.1E). These observations suggest that the flower of *A. malaccensis* is protandrous but because of the long overlap in anther dehiscence and stigma receptivity periods, there is a potential for selfing and this possibility is supported by isoenzyme results (Norwati 2000). Successful pollination is exhibited by the formation of young fruits (Fig. 3.4.1F) and a fully matured fruit can grow to a size of 3-4 x 2.5 cm (Fig. 3.4.1G).

Fig. 3.4.1. Floral and fruit biology of *Aquilaria malaccensis*. (A) The beginning of flowering usually coincides with leaf flush; (B) Young floral buds at the terminal shoot; (C) An inflorescence bears between 10 to 20 individual flowers; (D) A flower beginning to open; (E) Yellow anthers from a newly opened flower (left) and dark anthers in one that has reached senescence (right); (F) Very young fruits; (G) An almost fully developed fruit.

Twenty five and 29 insect specimens were collected from S1 and S2, respectively. Flowers in S1 and S2 were each visited by insects from at least four families (Annex 3). Table 3.4.1 lists specimens that had been identified to genus and species levels. The peak insect visitation periods for flowers in S1 and S2 were almost similar—in S1, these was between 21:00−01:00 and 11:00−15:00 and in S2, between 20:00−0.00 and 08:00−12:00. The night time peak period coincided with stigma receptivity and therefore insects visiting during that period may be considered as potential pollinators. There is apparently no overlap in species between S1 and S2 but further work is required to support this observation.

Table 3.4.1. The species and number of insects visiting *Aquilaria malaccensis* flowers in S1 and S2.

Order/Family	Species	Site	No. specimen(s)
Erebidae: Erebinae	*Oxyodes scrobiculata*	1	1
Hymenoptera: Vespidae	*Provespa* sp.	1	2
Diptera: Tabanidae	*Chrysops* sp.	1	5
Hymenoptera: Halictidae	*Patellapis* (*Pachyhalictus*) sp.	1	1
Hymenoptera: Apidae	*Trigona* (*Lepidotrigona*) *terminata*	2	4
Hymenoptera: Apidae	*Trigona* (*Heterotrigona*) *itama*	2	2
Hymenoptera: Formicidae	*Gesomyrmex chaperi*	2	1
Hymenoptera: Crabronidae	*Trypoxylon* sp.	2	1
Thomisidae: Thomisinae	*Thomisus guangxicus*	2	3

Fruits began to develop before the flowering phase ended and a single fruit could take up to 1.5 months to mature. The whole fruiting period may last for 3 months. The fruits are 1−2 loculed, mostly one-seeded, globose-obovoid or oblanceolate, rugose or smooth, puberulous to glabrous, to 3−4 x 2.5 cm (Fig. 3.4.1G). The fruits split loculicidally on the tree upon maturity and seeds are dispersed by gravity. The seeds are recalcitrant and germinate almost immediately but at low percentages (<19.4%).

During the 2014 masting event, abortion of both flowers and fruits occurred with flowers aborted before being fertilized and fruits aborted either due to damage or failure to develop (Table 3.4.2 and Fig. 3.4.2). Flower abortion rates were very high at 98.4% for tree AM267 and 97.2% for tree AM186. However, mature fruit production was significantly higher in tree AM267 compared to tree AM186. Based on the estimated floral load, the abortion rate for tree AM267 is 99% and tree AM186 is 99.5% (Table 3.4.2). More samples from different mother trees will be collected in the future to verify these data.

Table 3.4.2. Estimated number of aborted flowers, aborted and mature fruits and abortion rate for tree AM267 and tree AM186 during the 2014 masting event.

Tree	Floral load (%)	No. aborted flowers (%)	No. aborted fruits[1] (%)	No. mature fruits[2] (%)	No. mature seeds[3]	Abortion rate (%)
AM267 (S2)	11,182,977 (100)	11,009,364 (98.4)	66,943 (0.6)	106,669 (0.95)	90,155	11,076,308 (99)
AM186 (S1)	4,850,673 (100)	4,715,901 (97.2)	108,292 (2.2)	26,479 (0.55)	21,298	4,824,194 (99.5)

1: aborted fruits are immature whole fruits with or without signs of damage and dehisced capsules with signs of damage; 2: mature fruits successfully dehisced without signs of damage; and 3: actual number collected. We assumed that all non-aborted flowers developed into fruits.

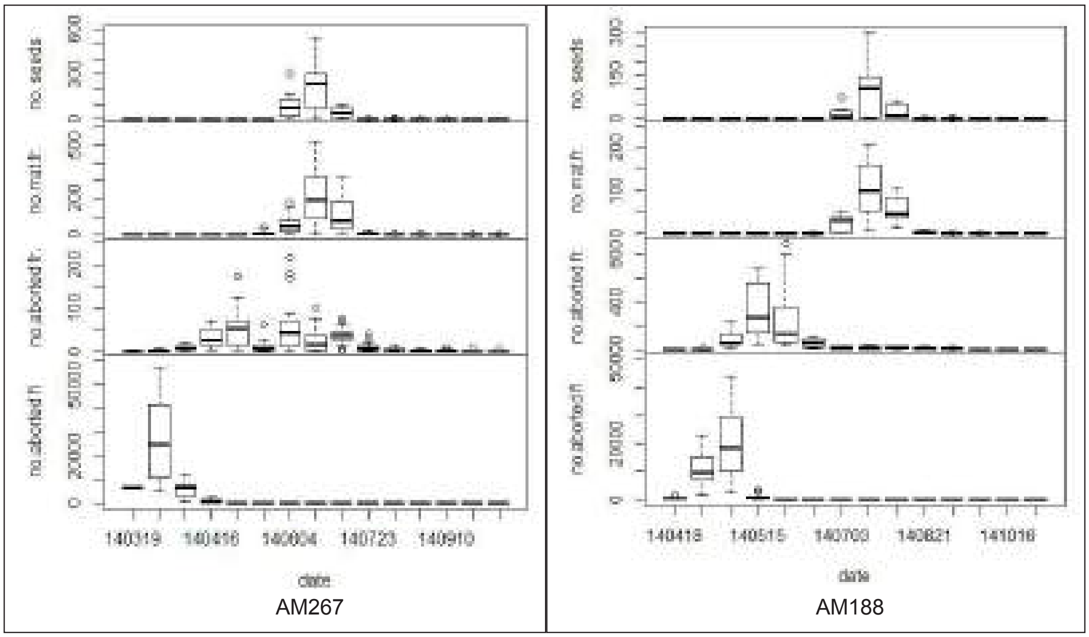


Fig. 3.4.2. Estimated numbers of aborted and mature flowers, fruits and seeds produced by tree AM267 and tree AM186 during the 2014 masting season.

Small mammals, mainly *Macaca fascicularis* (Cercopithecidae), *Ratufa bicolor* (Sciuridae) and *Callosciurus prevostii* (Sciuridae) predated the inflorescences and infructescences while insects such as *Heortia vitessoides* (Crambidae), *Pitama hermesalis* (Crambidae), *Zeuzera* sp. (Cossidae), scale insects of the family Diaspididae and whiteflies (Aleyrodidae) predated leaves, stems and also young fruits (Annex 3).

No reproductive ecology observations were conducted on the S6 population but based on the behaviour shown by the S1 and S2 populations, we speculate that the downward trend seen in the rate of population change was most likely influenced by traits associated with fecundity. The high floral abortion rate during a masting event and the supra-annual flowering behaviour also indicate low resilience of the species to harvesting impacts.

3.5 Genetic diversity

3.5.1 Genetic diversity within and among populations

Based on the 942 samples collected throughout Peninsular Malaysia and 12 microsatellite loci, a total of 159 alleles were detected. At the population level, the study revealed high levels of genetic diversity in *A. malaccensis* (Table 3.5.1.1). The mean number of alleles (A_a) was 5.414, ranging from 3.333 (Batu Papan) to 8.000 (Sungai Udang) whereas the mean expected heterozygosity (H_e) was 0.537, ranging from 0.447 (Batu Papan) to 0.642 (Lenggor). Based on microsatellite analysis, the H_e was high and comparable with other tropical trees such as its restricted congeners *Gonystylus bancanus* (0.691, Nurul-Farhanah 2014), *Swietenia macrophylla* (0.657, Novick *et al.* 2003) and *Santalum austrocaledonicum* (0.660, Bottin *et al.* 2005), and various dipterocarps such as *Shorea lumutensis* (0.648, Lee *et al.* 2006) and *S. ovalis* (0.640, Ng *et al.* 2004). However, the H_e was lower when compared with *Koompassia malaccensis* (0.798, Lee *et al.* 2008) and *Shorea curtisii* (0.790, Ng *et al.* 2006).

Rare alleles were detected in most of the *A. malaccensis* populations except in Kledang Saiong, Pelangai and Lentang. The highest number of rare alleles was found in Bukit Lagong and Panti (0.506 respectively). A total of 15 private alleles were detected across all loci (Table 3.5.1.1). Out of the 35 populations sampled, private alleles were detected only in 11 populations. The highest number of private alleles was found in Lenggor (4) followed by Nenggiri (2). This might indicate that these four populations harbour some unique genetic characteristics and should receive additional attention for conservation purposes.

The study also showed that Lenggor exhibited significant positive value of fixation index ($F$is = 0.183, $p < 0.05$; Table 3.5.1.1), an indication of excess of homozygotes, which might indicate depression due to inbreeding. Inbreeding causes the loss of heterozygosity with no change in allele frequencies, because continuous selfing will purge the deleterious recessive alleles and expose them as homozygotes to the environment. It is generally agreed that inbreeding is associated with increased seed abortion, low germination rates, high seedling mortality, and poor growth and flowering of the offspring. Thus, the priority management prescriptions should try to enlarge the Lenggor population to minimize inbreeding depression due to small population size.

Table 3.5.1.1. Gene diversity parameters of *Aquilaria malaccensis* throughout Malaysia, including mean number of alleles per locus (A_a), allelic richness (R_s), observed (H_o) and expected heterozyosity (H_e; Nei 1987), fixation index (F_{is}), number of rare alleles per individual and private alleles. Values in parentheses denote standard deviation.

Population	A_a	R_s	H_o	H_e	F_{IS}	Rare allele	Private allele
1. Machincang	5.083 (2.353)	3.822	0.614 (0.032)	0.596 (0.075)	-0.030	0.131	0
2. Lubuk Semilang	4.167 (2.290)	3.333	0.500 (0.035)	0.534 (0.078)	0.066	0.140	0
3. Bukit Malut	4.333 (2.640)	3.230	0.459 (0.031)	0.509 (0.078)	0.102	0.269	0
4. Bukit Perangin	5.667 (3.393)	3.818	0.548 (0.025)	0.554 (0.092)	0.010	0.294	1
5. Gunung Jerai	4.750 (2.701)	3.725	0.625 (0.035)	0.580 (0.080)	-0.081	0.158	0
6. Gunung Inas	4.417 (2.429)	3.666	0.568 (0.043)	0.549 (0.087)	-0.037	0.302	0
7. Gunung Bongsu	4.417 (2.275)	3.508	0.536 (0.036)	0.532 (0.085)	-0.009	0.189	1
8. Penang National Park	5.167 (2.691)	3.611	0.576 (0.029)	0.575 (0.070)	-0.002	0.306	0
9. Bukit Kerajaan	6.333 (4.163)	3.679	0.575 (0.019)	0.554 (0.079)	-0.039	0.447	1
10. Gunung Semanggol	4.750 (2.896)	3.263	0.523 (0.025)	0.516 (0.079)	-0.015	0.316	0
11. Bubu	5.167 (3.129)	3.551	0.514 (0.030)	0.526 (0.083)	0.022	0.355	0
12. Kledang Saiong	3.667 (2.348)	3.479	0.536 (0.054)	0.492 (0.085)	-0.098	0.000	0
13. UTP	6.833 (5.391)	4.099	0.585 (0.025)	0.571 (0.091)	-0.025	0.415	0
14. Bukit Tapah	5.167 (3.512)	2.972	0.505 (0.024)	0.467 (0.088)	-0.081	0.484	0
15. Bukit Lagong	7.083 (5.435)	3.865	0.531 (0.024)	0.534 (0.089)	0.005	0.506	0
16. Mont Kiara	6.667 (4.942)	3.929	0.560 (0.023)	0.565 (0.091)	0.009	0.375	0
17. Pelangai	3.750 (2.633)	3.248	0.461 (0.049)	0.458 (0.096)	-0.006	0.000	0
18. Pasir Panjang	5.583 (3.801)	3.732	0.554 (0.032)	0.531 (0.092)	-0.044	0.284	0
19. Solok Duku	6.833 (5.306)	3.888	0.525 (0.023)	0.538 (0.091)	0.025	0.378	1
20. Sungai Udang	8.000 (5.752)	3.987	0.528 (0.019)	0.537 (0.090)	0.017	0.490	1
21. Paya Rumput	5.417 (3.753)	3.705	0.586 (0.024)	0.543 (0.085)	-0.079	0.277	1
22. Maokil	6.417 (5.178)	3.890	0.514 (0.027)	0.529 (0.092)	0.029	0.338	1
23. Panti	6.750 (5.396)	3.627	0.544 (0.018)	0.538 (0.083)	-0.011	0.506	1
24. Lenggor	5.417 (3.175)	4.508	0.530 (0.044)	0.642 (0.083)	0.183*	0.108	4
25. Lentang	3.750 (2.221)	3.621	0.548 (0.055)	0.516 (0.102)	-0.066	0.000	0
26. Som	5.417 (3.605)	3.847	0.560 (0.036)	0.542 (0.087)	-0.034	0.292	1
27. Tekai-Tembeling	5.250 (3.415)	3.399	0.542 (0.032)	0.492 (0.090)	-0.105	0.349	0
28. Berkelah	6.167 (4.174)	3.753	0.561 (0.030)	0.535 (0.089)	-0.049	0.459	0
29. Beserah	5.500 (3.477)	3.798	0.600 (0.028)	0.590 (0.075)	-0.016	0.333	0
30. Merchang	6.083 (3.777)	3.577	0.494 (0.025)	0.527 (0.082)	0.065	0.452	0
31. Gunung Tebu	6.250 (3.934)	3.856	0.567 (0.026)	0.550 (0.091)	-0.031	0.440	0
32. Chabang Tongkat	6.167 (3.786)	3.724	0.547 (0.021)	0.541 (0.085)	-0.011	0.365	0
33. Jeli	4.500 (2.393)	3.744	0.520 (0.044)	0.553 (0.091)	0.063	0.259	0
34. Nenggiri	5.250 (3.841)	3.701	0.539 (0.035)	0.545 (0.092)	0.010	0.222	2
35. Batu Papan	3.333 (2.015)	2.643	0.508 (0.031)	0.447 (0.087)	-0.140	0.275	0
Mean	5.414 (3.549)	3.651	0.542 (0.031)	0.537 (0.086)	-0.012	0.300	-

*p = 0.05

The levels of genetic diversity of a plant species can be attributed to the species' life history traits, in particularly its reproductive system. However, comprehensive studies on the breeding process of *A. malaccensis* are still lacking. Investigations of its reproductive biology revealed that *Aquilaria* species are insect-pollinated and obligate outcrossers with generally high seed production but limited seed dispersal (Soehartono & Newton 2001b). The *A. malaccensis* flower structure is characterized as hermaphroditic. However, from the mating system study conducted by Norwati (2000) and as also shown here by its being insect-pollinated, we can conclude that *A. malaccensis* is predominantly an outcrosser. Thus, the high levels of genetic diversity observed in *A. malaccensis* might be attributed to the species' life history and ecological traits such as its longevity and its mixed-mating system.

The coefficient of population differentiation quantified using *F*-statistics showed that most of the total genetic diversity was partitioned within the population. The proportion of genetic diversity distributed among populations was estimated at 0.081, thus only 8.1% of the genetic variability was distributed among populations. In comparison with other tropical tree species (Hamrick *et al.* 1992), these values are comparable with the means for regionally distributed long-lived tree species (0.119), long-lived outcrossing animal pollinated tree species (0.099), long-lived tree species with seed dispersed by gravity (0.131), and long-lived tree species that reproduce sexually (0.086). Isolation-by-distance via Mantel's test showed that the pairwise F_{ST} values were significantly correlated with geographic distance (r = 0.204; $p < 0.01$). This may indicate that populations that live near each other are genetically more similar than the populations that live further apart.

Moderate levels of population differentiation and significant isolation-by-distance in *A. malaccensis* can be attributed to restricted gene flow due to inefficient pollen and seed dispersal. *Aquilaria malaccensis* is pollinated by low-energy insects (see results of this study). The species produces seed that hangs by a thread-like appendage from the fruit capsule after dehiscence and is dispersed mainly by gravity. However, recently, Manohara (2013) reported that the wasp, *Vespa affinis* L. could disperse *A. malaccensis* seeds up to 500 m from the parent tree. Even though the wasp mediated seed dispersal mechanism contributed only one-third to overall seed dispersal (Manohara 2013), it may probably still contribute to gene flow over longer distances. As *A. malaccensis* is widespread; it is likely that in the past the species was more widely distributed than it is today. Therefore, the gene flow between plants via seeds and/or pollen was probably more extensive and unhindered in the past before the populations become isolated. High genetic diversity and moderate population differentiation of *A. malaccensis* in Peninsular Malaysia can be attributed to limited gene flow due to inefficient pollen and seed dispersal or insufficient length of time for further differentiation of genetic diversity following a recent fragmentation of a once continuous genetic system.

3.5.2 Relatedness among populations

The relatedness among the populations was determined by using three approaches, i.e. cluster analysis based on D_A genetic distance, Principal Component Analysis (PCA) and STRUCTURE analysis. A dendrogram of D_A genetic distances derived by the neighbour-joining algorithm is shown in Fig. 3.5.2.1. In general, weak bootstrap support (< 60%) could be seen in most nodes except in two clusters, i.e., Lubuk Semilang/Bukit Malut/Machincang (99%) and Merchang/Gunung Tebu (62%). Nonetheless, the groupings separated Peninsular Malaysia into two geographic sub-regions: Cluster 1–Kedah, Penang and Perak; and Cluster 2–Kelantan, Terengganu, Pahang, Selangor Negeri Sembilan, Melaka and Johor.

In PCA 1, the first two axes (both axes were significant, $p < 0.01$) explained 35.14% of the total variation. As observed, populations from Cluster Kelantan-Johor were showed to be genetically distinctive from the Cluster Kedah-Perak, with Machincang, Lubuk Semilang and Bukit Malut shown to be further apart from the rest of the populations (Fig. 3.5.2.1). The PCA 2 generated two significant axes ($p < 0.01$) with 48.07% total variation and Machincang, Lubuk Semilang and Bukit Malut appeared to group into one island population, whereas Bukit Tapah was isolated from the rest of the populations (Fig. 3.5.2.2). In PCA 3, two significant axes ($p < 0.01$) with 30.80% total variation nevertheless could not reveal a clear separation among populations in Cluster Kelantan-Johor.

The STRUCTURE analysis together with STRUCTURE HARVESTER estimated the most likely number of clusters [LnP(D) or Ln(K)] based on Bayesian approach (Figs. 3.5.2.1 & 3.5.2.3). The highest likelihood was found when $K = 2$ was detected by the mean difference between successive likelihood values of K, L(K) plotted for each K. The maximum value of ΔK also revealed the real value of $K = 2$ (Fig. 3.5.2.3), further supporting that the most probable number of populations was two (Evanno *et al*. 2005).

As the cluster analysis partitioned the populations into two genetic clusters, corresponding to two geographical regions in Peninsular Malaysia (Fig. 3.5.4.1), these two regions should be considered independently for the selections of *in situ* conservation areas. *Aquilaria malaccensis* has 8.1% of the total genetic diversity residing among populations. Therefore, five strategically placed populations in each of the two regions should capture the majority of their total genetic diversity and *in situ* conservation of these populations is likely to be sufficient to prevent the species from becoming an endangered species.

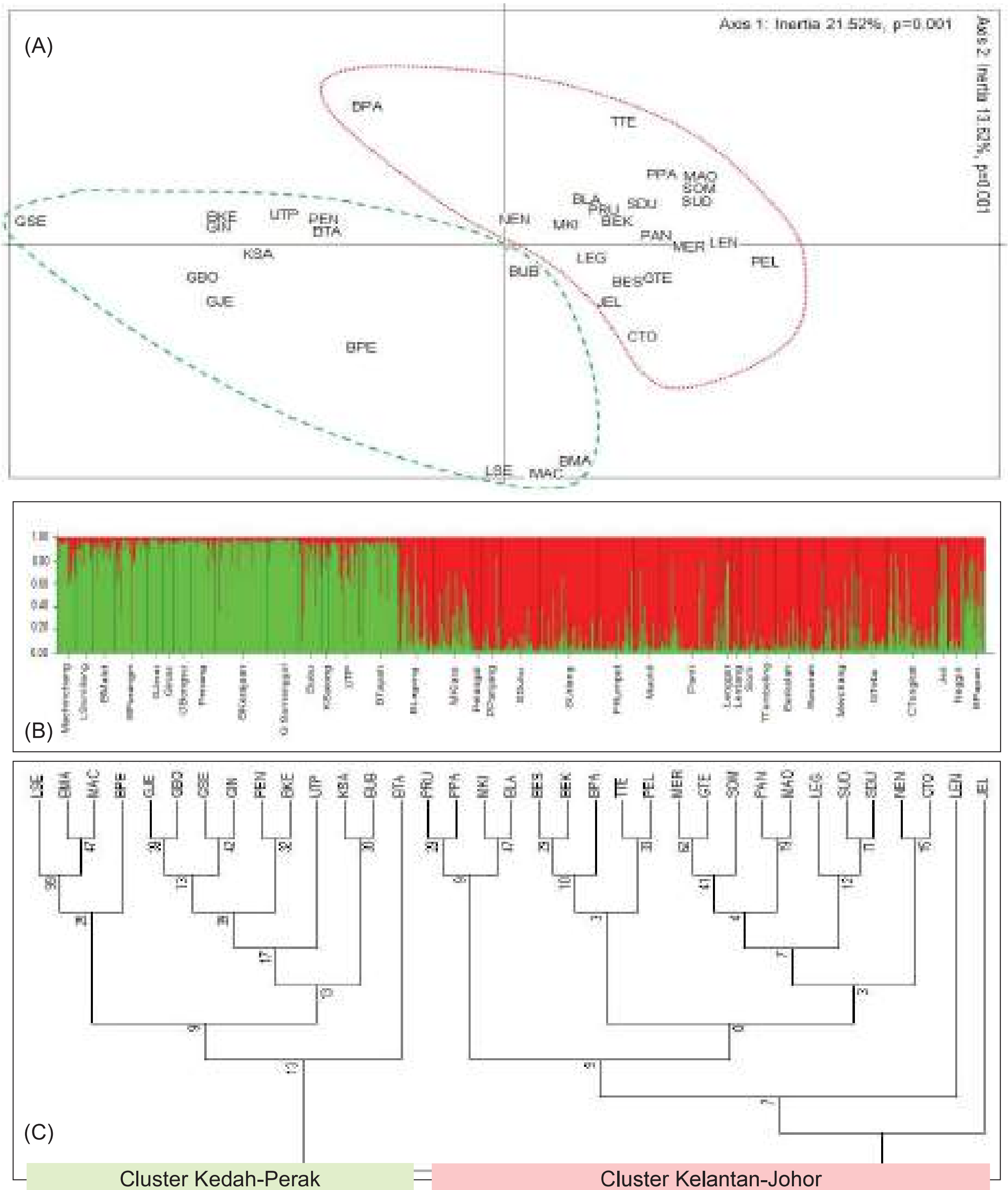


Fig. 3.5.2.1. Relationship among populations determined using (A) Principal Component Analysis; (B) Bayesian analysis via STRUCTURE; and (C) Dendogram based on genetic distance (D_A) derived using neighbour-joining algorithm. Nodes with 3000 replication bootstrap support.

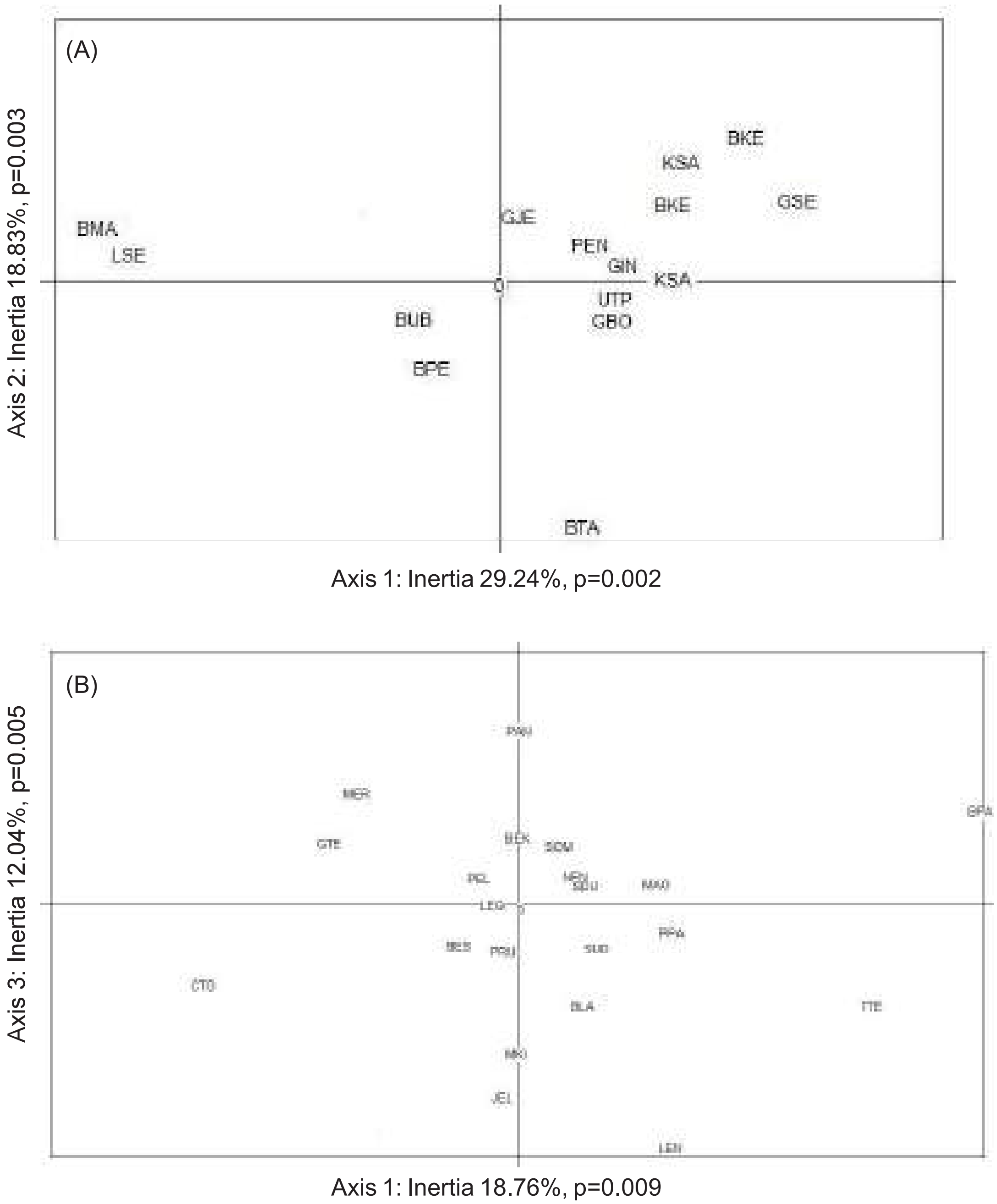


Fig. 3.5.2.2. Principal Component Analysis performed for (A) Cluster Kedah-Perak; and (B) Cluster Kelantan-Johor.

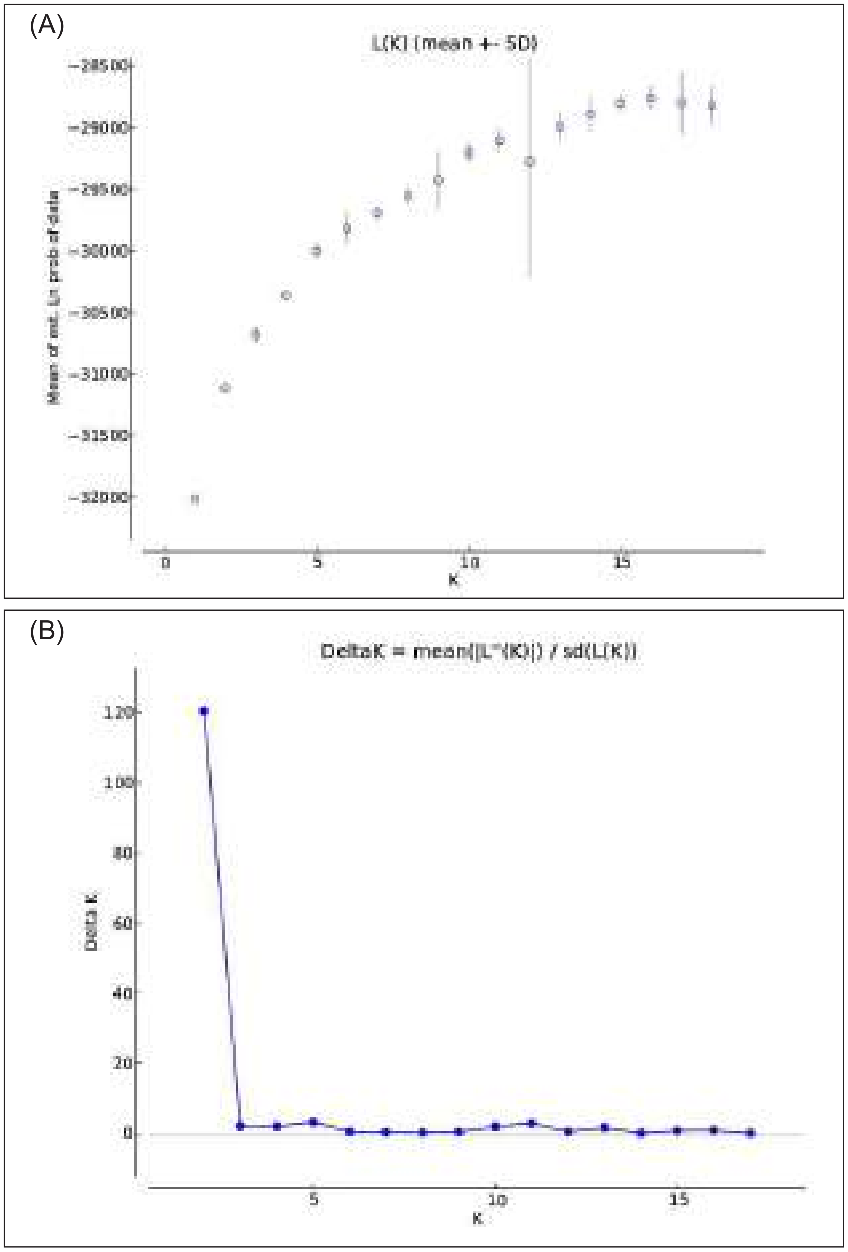


Fig. 3.5.2.3. Graphical plot of detection method for the true number of clusters *K* over 20 runs, 50 000 length of the burn-in and 100 000 MCMC respectively for each *K* value: (A) Mean L(K) (± SD) and (B) ΔK calculated as $\Delta K = m|L''(K)|/s[L(K)]$. The true number of *K* is 2.

3.5.3 Optimum population size

Fig. 3.5.3.1 shows the sample sizes plotted against percentage number of alleles with standard errors. Based on the simulation analysis using a computerized algorithm (in accordance with Lee *et al*. 2002), in order to maintain 95% of its genetic diversity, the optimum population size of *A. malaccensis* is postulated at 390 individuals with standard errors ranging from 250−550. This data is an important contribution to the species' conservation strategy.

3.5.4 Implications for conservation

Genetic information is essential to generate conservation guidelines and management of a species. The genetic data enable identification of prioritized populations for conservation (Petit *et al.* 1998; Melville & Burchett 2002), given that not all populations have equal adaptive capacities. There are three main objectives for preserving genetic resources; these are (i) to protect the potential adaptation of a species (Young & Boyle 2000; Krauss *et al*. 2002), (ii) to preserve current genetic structure as reference material for future comparison, and (iii) to save populations that are endangered from anthropogenic activities, directly or indirectly (Eriksson & Ekberg 2001; Finkeldey & Hattemer 2007). Hence, the establishment of *in situ* and *ex situ* conservation areas are as important as the sustainable utilization of natural forests (Cossalter 1989; Finkeldey & Hattemer 2007). In this study, the genetic information generated will be used to construct three main conservation and management guidelines for *A. malaccensis* in Peninsular Malaysia.

Guideline 1: *In situ* conservation of *A. malaccensis*

One of the criteria set for *in situ* conservation is the number of populations known to be sufficient to cover the maximum preservation of the species' gene pool and which populations to select (Prance 2006). Suitable representation and viability of important populations influence the effectiveness of genetic conservation (Thomson *et al.* 2001). For instance, selection of only a few populations of *Pinus palustris* would be needed to maintain most of its genetic diversity since it is a widespread and wind-dispersed species with high gene flow (Duba 1985). In contrast, all the populations of *Sarracenia leucophylla* might have to be conserved as it has a narrow distribution with restricted gene flow (Wang *et al.* 2004).

In the present study, since the cluster analyses partitioned the populations into two genetic clusters (Fig. 3.5.4.1) corresponding to two geographical regions in Malaysia, these two regions should be considered independently for the selection of *in situ* conservation areas. Hamrick (1993) proposed that for tropical tree species, if 80% of the genetic diversity is partitioned within populations, then five strategically placed populations should be able to capture 99% of their total diversity. Graudal *et al.* (1995) proposed that one to three gene conservation areas would be likely to be sufficient for widespread and highly outcrossing species. They opined that many more and perhaps smaller conservation areas would be needed for species with mixed-mating systems and high percentage of selfing, or outcrossing species with scattered and disjunct distribution patterns. *Aquilaria malaccensis* has 8.1% of its total genetic diversity residing among populations, i.e. 91.9% of its genetic diversity is partitioned within populations. Therefore, five strategically placed populations in each of the two regions should capture the majority of their total genetic diversity. This in addition to *in situ* conservation of these populations is likely to be sufficient to prevent the species from becoming an endangered species. With the consideration of underlying genetic diversity (A_a >5, H_e >0.5) and the current status of population health (population should possess >10 large trees) in each of the 35 populations, the following 16 populations were identified as potential *in situ* conservation areas for *A. malaccensis* in Malaysia (Fig. 3.5.4.1): Machinchang, Penang NP, Bukit Kerajaan, Gunung Jerai, Bubu and UTP from Cluster Kedah-Perak; and Chabang Tongkat, Gunung Tebu, Merchang, Berkelah, Panti, Paya Rumput, Sg. Udang, Pasir Panjang, Mont Kiara and Bukit Lagong from Cluster Kelantan-Johor.

Another important criterion set to best determine the success of the *in situ* conservation programmes was to estimate the minimum population size that was large enough to avoid effects of inbreeding depression and counter balance the loss of genetic diversity by genetic drift. Based on a simulation analysis, in order to maintain 95% of its genetic diversity, the minimum population size of *A. malaccensis* was calculated as 390, ranging from 250 to 550 large trees (Fig. 3.5.3.1). Previous studies using a similar approach on *Intsia palembanica* (Lee *et al*. 2002), *Koompassia malaccensis* (Lee *et al.* 2003), *Shorea lumutensis* (Lee *et al*. 2006) and *Gonystylus bancanus* (Nurul-Farhanah 2014) reported minimum population sizes of 200, 190, 270 and 420 individuals, respectively.

When planning a conservation area, a minimal population size should only be regarded as a last resort and an extreme compromise. For added safety, much larger populations should constitute units of *in situ* conservation (Hawkes *et al*. 1997). Thus, for *A. malaccensis*, conserving >300 trees per population will be sufficient to maintain maximum levels of genetic diversity to withstand loss of genetic variability due to genetic drift. This should also be enough to contain the minimum number of reproductive individuals to prevent inbreeding. For *A. malaccensis* the minimum number of reproductive individuals needed to prevent inbreeding would be 65 mature trees >20 cm dbh. The *in situ* conservation areas to be established should have a central core area, surrounded by a buffer zone and on its periphery, a transition zone. The presence of a buffer zone will protect the population of *A. malaccensis* present in the core from edge effects and other factors that might threaten its viability. The transition zone, however, may be made available for sustainable harvesting activities.

The establishment of *in situ* conservation areas is not decided solely on the basis of biological expedience or scientific principles; political determination will play a part. Malaysia has a federal system of government. Under the Malaysian constitution, land (including forested land) is defined as a state responsibility and each state is empowered to enact laws and to formulate policies independently (Lee & Krishnapillay 2004); the reservation of conservation areas is therefore affected by state legislation. Hence, to ensure effective conservation of *A. malaccensis*, the state governments need to urgently designate these aforementioned areas as strictly protected areas. The establishment of *in situ* conservation areas will not only conserve *A. malaccensis* but also help to conserve the forest ecosystem and other important but non-targeted species found within these areas.

Guideline 2: Plant material transfer guideline for *A. malaccensis*

In this study, the genetic structure analyses divided the populations into two genetic clusters, corresponding to two main regions: region Kedah-Perak and region Kelantan-Johor. By preserving the genetic structure and its resources, the species has a higher chance to adapt to environmental changes and survive in the event of disaster. Therefore, transfer of plant materials from a population in region Kedah-Perak should be restricted to locations within that region. For example, the transfer of *A. malaccensis* wildlings from Bukit Kerajaan (Penang) to Bukit Tapah (Perak) is acceptable as it is within the region Kedah-Perak. On the other hand, planting of *A. malaccensis* from the region of Kedah-Perak in the region of Kelantan-Johor should be avoided and vice versa.

Guideline 3: *Ex situ* conservation of *A. malaccensis*

For *ex situ* conservation, similar to the selection of *in situ* conservation areas, the two geographical regions should be considered independently for the selection of mother trees for seed collection. As the species is an outcrosser, and about 91.9% of its genetic diversity is partitioned within the population, a minimum of 25 mother trees per region should be used to establish a field gene bank. Using 40 progenies per mother tree would provide a stand of 2000 individuals. If the individuals are line-planted at a spacing of 5 x 5 m, a minimum area of 5 ha is required.

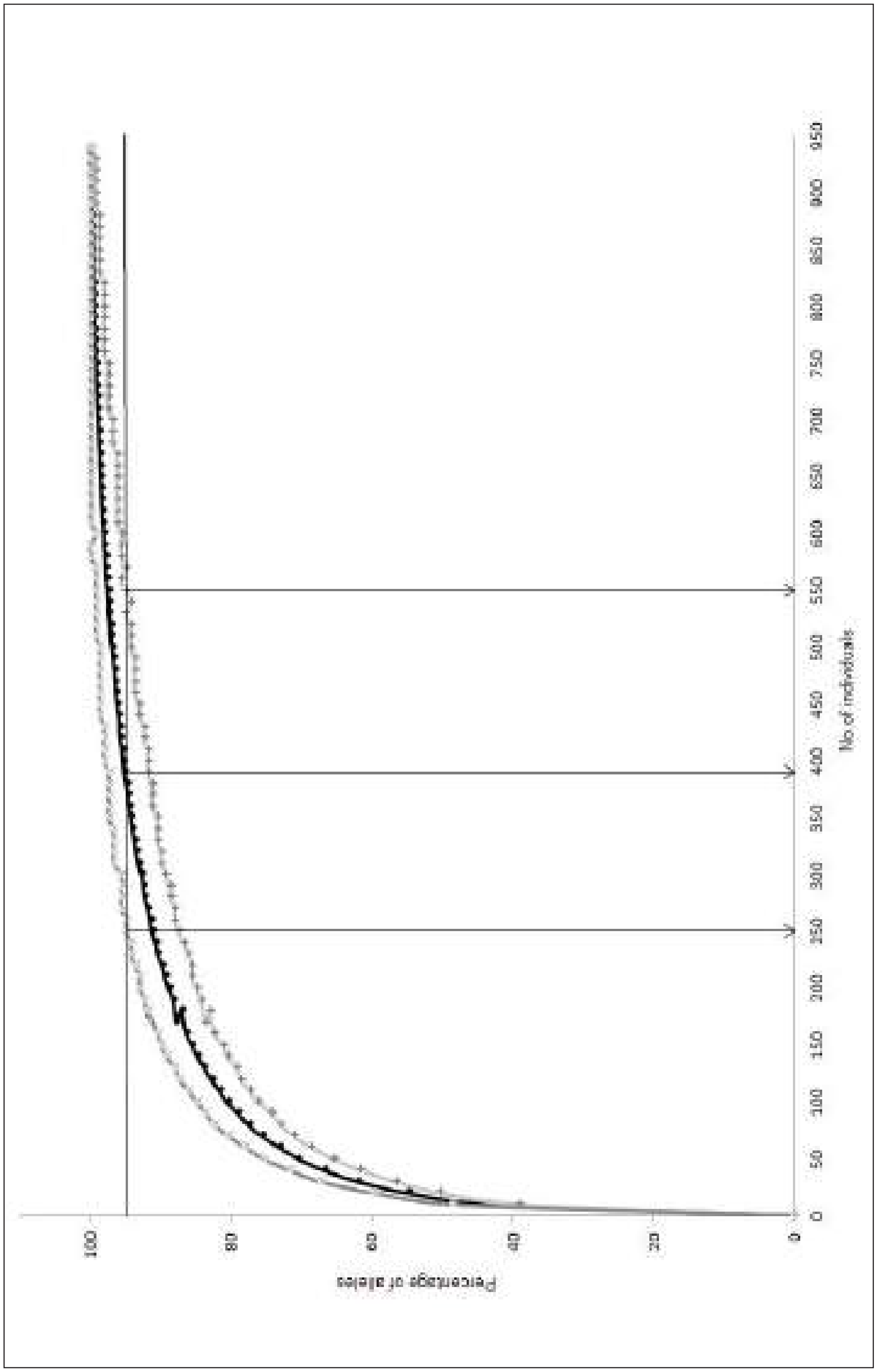


Fig. 3.5.3.1. Relationship between percentage of alleles against sample size. All values were based on 1000 resamplings from 930 of the 942 individuals with standard errors (SE). Grey lines represent standard errors.

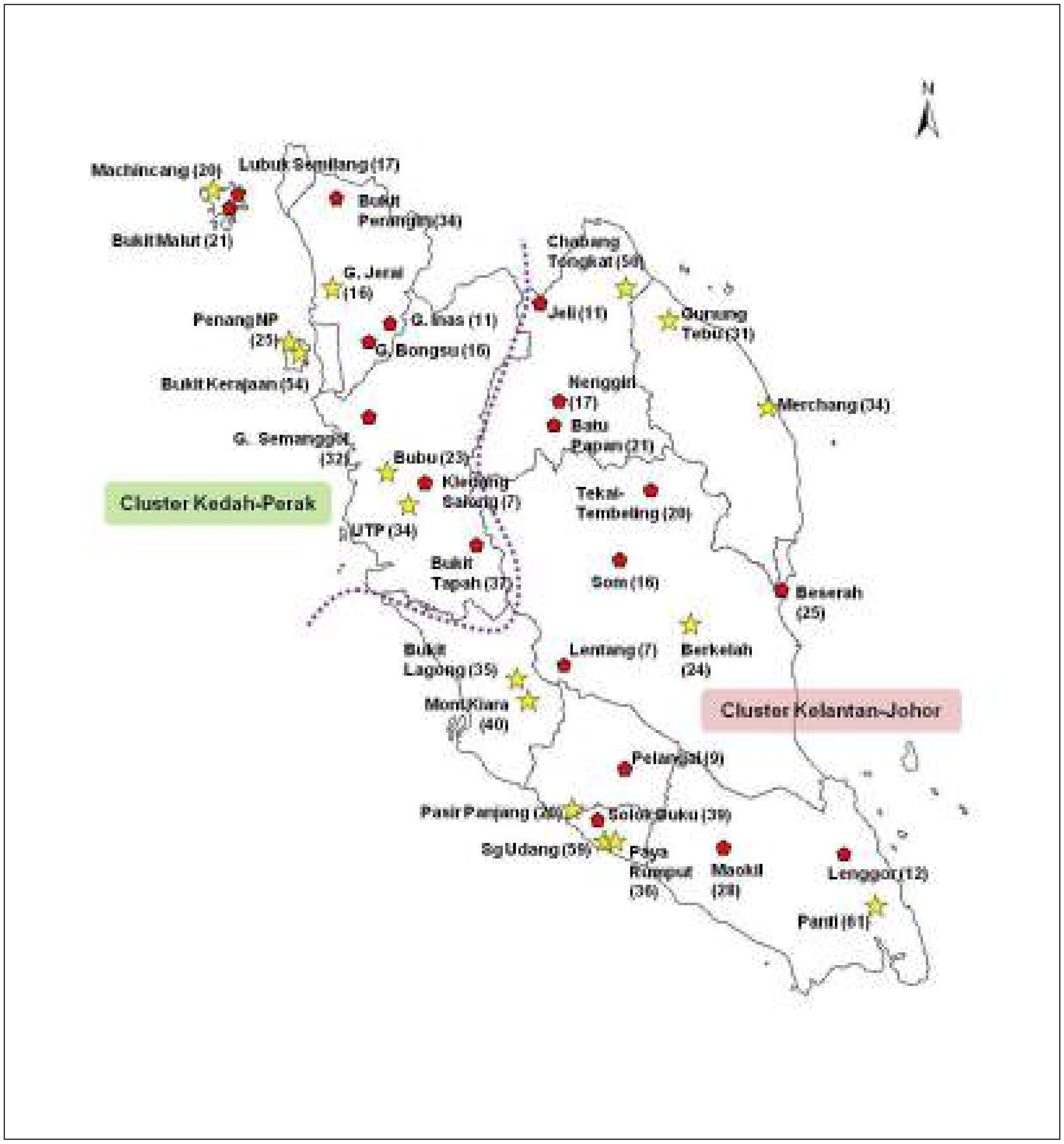


Fig. 3.5.4.1. Distribution of *Aquilaria malaccensis* populations partitioned into two unique genetic clusters. Yellow stars denote the priority areas for *A. malaccensis* conservation.

3.6 Non-Detriment Finding (NDF)

Tables 3.6.1 and 3.6.2 outline the partial NDF for *Aquilaria malaccensis* in Malaysia. A summary of the assessment indicates that the species has a generally low resilience and its wild populations are likely to be strongly impacted by harvesting.

Table 3.6.1. Assessment of the resilience of wild populations of *Aquilaria malaccensis* to harvesting.

Resilience factor	Information	Higher Resilience	Lower Resilience	Ref No.
Biological characteristics				
Life form vs. harvested plant part	• Perennial tree between 21–40 m tall; • Lethal harvest of bark, stem, roots; • Harvest of leaves.		√	14, 76, 86
Distribution	Wide in the Indo-Malayan region from the Assam district in India, through Burma and south-eastern China (Hong Kong, Hainan) to south-east Asia (Indochina, Borneo, Philippines, Malay Peninsula, Sumatra, Moluccas (Morotai, Ceram, Ambon, Halmahera) and New Guinea)	√		14, 86
Habitat	• No habitat preference, highly adaptable to various habitat types; • Representative habitats well conserved and stable.	√		14, 86
National abundance	• Observed population sizes: small; • Spatial distribution: scattered in natural forests.		√	51
National population trend	Rate of population change decreasing.		√	This report
Threats	Harvesting: multiple and severe; Habitat loss: minor.		√	This report
Reproduction	• Hemaphrodite; • Flowering phenology: supra-annual; • Potential pollinators: mainly Hymenoptera.		√	This report
Regeneration	• Mortality is consistently higher than recruitment and the rate of population change is decreasing; • Sprouting capability of stumps has been observed; • Regeneration guild: primary.		√	This report

Dispersal	• Seed type: recalcitrant • Seed dispersal strategy: most likely small mammals • Dispersal efficiency: unknown • Disperser abundance: unknown • Germination: ranged from 0−19%		√	This report
Harvest characteristics				
Harvest specificity	Target species easy to identify, no close look-alikes	√		9
Demographic segment of population	Both mature and juvenile (excluding saplings and seedlings) plants harvested		√	9
Multiple use	Multiple, non-conflicting uses	√		9
Yield per plant	Uncertain		√	
Scale of trade	Domestic and international trade fluctuate but the trend is declining due to the decline in supply (Fig. 1.3)		√	10
Utilization trend	Increasing fast		√	10

Table 3.6.2. Assessment of factors affecting the management of *Aquilaria malaccensis*

<table>
<tr><th>Factors of sustainability</th><th>Information</th><th>Ref No.</th></tr>
<tr><td colspan="3">Biological characteristics</td></tr>
<tr><td>Role of the species in its ecosystem</td><td>Characteristics outlined in Table 3.6.1 indicate that as a species, it is unlikely to have a significant role in the ecosystem. It is neither a keystone or guild species. As a supra-annual species, its contribution as a food source is likely to be intermittent. Hence, ecosystem processes are unlikely to be interrupted or changed by its removal.</td><td>This report</td></tr>
<tr><td colspan="3">Population status</td></tr>
<tr><td>Global and national distribution</td><td>Table 3.6.1. and Fig. 1.1</td><td>This report</td></tr>
<tr><td>National and global conservation status</td><td><table>
<tr><th>Species</th><th>Malaysia Plant Red List</th><th>IUCN</th></tr>
<tr><td>Aquilaria beccariana</td><td>DD</td><td>VUA1d</td></tr>
<tr><td>A. hirta</td><td>VUA4cd</td><td>VUA1d</td></tr>
<tr><td>A. malaccensis</td><td>VUA4cd</td><td>VUA1cd</td></tr>
<tr><td>A. microcarpa</td><td>DD</td><td>VUA1d</td></tr>
<tr><td>A. rostrata</td><td>DD</td><td>CRB1ab(v)</td></tr>
</table></td><td>32, 48</td></tr>
<tr><td>National population trend</td><td>Population trend is decreasing</td><td>This report</td></tr>
<tr><td>Global population size and trend</td><td>Unknown but likely to be decreasing based on personal communications with range states.</td><td></td></tr>
<tr><td colspan="3">Harvest management</td></tr>
<tr><td>Regulated / unregulated</td><td>Regulated through the:
• implementation of a national export quota of 200,000 kg; and
• mandatory issuance of removal pass at the point of first exit.</td><td></td></tr>
<tr><td>Management history</td><td>For many decades, harvesting is conducted at low densities by local communities as part of their source of livelihood. No additional management history known.</td><td></td></tr>
<tr><td>Illegal harvest or trade</td><td>A significant national problem (see Table 1.1, Fig. 1.3 and Annex 1)</td><td></td></tr>
<tr><td>Management plan</td><td>• No on-site management plan;
• Conservation measures are available but generic in approach;
• National legislation and international framework that assist the conservation of the species ;
• No specific restoration measures because of its lack of habitat specificity;
• Records of collection through the issuance of removal passes;
• Size of tree that is to be harvested is no longer self-imposed, fear of loss of potential income is the primary factor that lowers size threshold;
• Collection takes place all year round.</td><td></td></tr>
</table>

Control of harvest		
Percent of harvest in Protected Areas	Unknown, but present as indicated in Table 1.1 and Annex 1	
Percent of harvest in areas of strong tenure	Unknown	
Percent of harvest in open access areas	Unknown	
Proportion of range or population protected from harvest	14% of the species' natural range or population is legally excluded from harvest	
Confidence in effectiveness of strict protection measures	Confidence fluctuates with the changes in annual operational budget funds. The fund determines the frequency and intensity of enforcement activities.	
Effectiveness of regulation of harvest effort	Unknown	
Confidence in harvest management	None	
Monitoring of harvest		
Monitoring of collection impact and management practices	There is baseline information on the population size, distribution and frequency of dbh categories of selected populations based on direct observations and surveys. Data on the quantity of annual national exports and records on quantities collected from the PRFs are not readily available.	
Confidence in monitoring	Low but may be improved when enabling factors that enhance enforcement capacities and activities have improved substantially.	
Other factors that may affect whether or not to allow trade	None	

The proposed action plan presented in Table 4.1 draws upon the results from this Activity, stakeholders' dialogue as well as existing and past projects as mentioned above.

The goal of the action plan is to ensure that future harvesting does not continue to threaten the survival of this species as well as other *Aquilaria* species in Malaysia. This goal is in line with the National Policy on Biological Diversity (2016−2025) Goal 3: We have safeguarded all key ecosystems, species and genetic diversiy, Target 8: By 2025 the extinction of known threatened species has been prevented and their conservation status has been improved and sustained, and the Convention of Biological Diversity Strategic Plan for Biodiversity (2011−2020) Aichi Biodiversity Target 12: Reducing risk of extinction. This goal also reflects the aim of CITES that seeks to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

To achieve this goal, a holistic approach is required that looks beyond the research efforts that had been undertaken. For this purpose, six elements need to be considered. These are (1) conservation and monitoring; (2) resource management and monitoring; (3) establishment of plantations; (4) research and development; (5) enforcement; and (6) enabling factors. Many of these elements are already in place but requires enhancement. In addition, these elements are not mutually exclusive but this division is necessary for the ease of planning, implementation and monitoring. The main objectives and outcomes are identified for each element.

To make this plan practical, it is developed within the government's existing framework for environmental and biodiversity conservation. Addressing these elements will require the support and involvement of all sectors in the industry and from the government, including enhanced financial support and enabling mechanisms that have been established. These enabling factors are implicit in each objective. It is necessary to note that this plan is not exhaustive in that not all outcomes necessary to achieve the objectives are included here; only those considered as priorities are listed. Hence this plan should be viewed as part of adaptive management and should be reviewed and revised accordingly.

The first objective relates to the conservation of *Aquilaria* species in Malaysia. Results from our studies have shown that unregulated harvesting activities had contributed to the decline in population change. This change is exacerbated by its infrequent reproductive frequency, high flower and fruit abortion rates, poor recruitment and high mortality. This functional behaviour is expected to persist throughout its life period. Together with the threat from unsustainable harvesting, these will negatively impact the survival of natural populations. The first objective therefore, is to ensure that sufficient numbers of representative wild populations are conserved throughout the range of the species. The protocol for the selection of representative populations is to know how many populations are sufficient to cover the maximum preservation of the species' gene pool and which populations to select (Annex 4 and Fig. 3.5.4.1) and is based on the presently known levels of genetic and population diversity of *A. malaccensis* in the peninsula. These populations should be monitored periodically to determine the status of its individuals.

The second objective is to enhance the manner in which the resource is being managed and monitored. Gaps in the current management of PRFs have been identified and the immediate associated activities to address these are listed in Table 4.1. Periodic monitoring is again essential and should be conducted more frequently than the current practice of once in ten years but this is subject to the availability of funds. This monitoring should also include populations in the protected areas. The results from such activities would enable adaptive management. Where information is severely lacking, the use of the precautionary principle approach on whether to approve licences and permits for harvesting should be applied.

The third objective is to enhance the production of artificially propagated *A. malaccensis* using the plantation approach. This will prevent the above-mentioned problems associated with harvesting of wild materials, thus allowing better control of harvesting and trading activities. Malaysia is implementing the guidelines that have been established under CITES and these mechanisms need only to be enhanced by the respective Management and Scientific Authorities.

The fourth objective is to further enhance research and development in aspects related to *in situ* and *ex situ* conservation and the plantation sector, in particular, the quality of planting materials. One of the biggest problems faced by Malaysia when using this approach is the mixed and often inferior quality of planting materials. An unregulated planting stock industry and insufficient scientific data on the potential quantity and quality of resin put farmers at risk in the venture. Breeding is a key R&D activity which can only be facilitated by the presence of field and seed genebanks. In addition, looking beyond *A. malaccensis*, the R&D programme should also include *A. hirta*, the lesser known relative of *karas*.

The fifth objective is to enhance enforcement at national and state levels. This essentially requires enhanced networking and sharing of information between enforcement agencies to increase stakeholders' engagement, the use of DNA profiling technologies to assist in the identification and origin of seized specimens and improvement in institutional governance.

The sixth objective is to enhance the enabling factors to improve the resilience of extant populations to harvesting pressures. These factors are mainly cross-cutting and may include some which are covered under any one of the above five objectives including the necessary Communications, education and public awareness (CEPA) programmes.

Table 4.1 outlines the objectives and desired outcomes and translates these into tangible activities to be implemented by the relevant stakeholders. It presents the actions which must be taken, and by which leading agency and when, in order to achieve the outcome. In addition, each action lists a measurable indicator against which progress will be monitored. The first agency named is the leading agency—it will collaborate with other agencies but will be ultimately responsible for the implementation of the action and reporting of progress to the Lead Management Authority. Some outcomes are achievable within the next five years. Others may take longer, and any additional time required for these is dependent on the performance of the related agencies over the next five years. Additionally, an adaptive style of management is preferred and hence, a review and enhancement of this action plan is necessary. Where possible, actions are listed in a logical order but this does not apply to the last objective which has a cross cutting approach.

Table 4.1. Proposed outline of the objectives, outcomes, actions, implementing agencies, indicators and timelines to achieve the goal of the action plan.

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Objective 1	**Ensure that sufficient numbers of representative wild populations are conserved throughout its range**								
Outcome 1.1	Sufficient numbers of wild populations are conserved in its natural habitats and range								
Action 1.1.1	Identify at least five populations in each of the geographical regions of Kedah-Perak and Kelantan-Johor	FRIM, State Forest and Wildlife Departments, private and public landowners	Five populations each in the Kedah-Perak and Kelantan-Johor regions are identified and the operational/ administrative mechanisms to conserve these populations are established	Minutes of discussions, consultations and meetings					
Action 1.1.2	Demarcate a buffer zone of at least 200 m width for each target population	State Forest and Wildlife Departments, private and public landowners		Buffer zones demarcated					
Action 1.1.3	Provide legal protection for these populations if not already provided for	State Forest and Wildlife Departments, private and public landowners	These populations are legally protected	Minutes of meetings that deliberate legal aspects of species and habitat protection					
Action 1.1.4	Develop monitoring protocol guidelines to determine trend in population change	FRIM	Stakeholders are trained to conduct monitoring	Number of capacity building workshops conducted					

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Objective 2	**Enhance resource management and monitoring in the Permanent Reserved Forests (PRFs)**								
Outcome 2.1	Resource management of *Aquilaria* in the PRFs is enhanced								
Action 2.1.1	Conduct detailed inventory of karas populations at periodic intervals at state level	FDPM	Inventory data from PRFs is available for use by relevant stakeholders	Size class distribution of karas populations, reports from inventory activities					
Action 2.1.2	Determine, from the inventory, maximum harvest quantity allowed at the state level	NRE, FDPM	Maximum harvest quota is in place for each state	Director-General's notifications/circulars, minutes of meetings					
Action 2.1.3	Assess regularly whether the harvest quota reflects sustainability of the resource	FDPM, State Forest Departments	Annual export quota revised according to the results of the assessment	Assessment reports, discussion notes					
Action 2.1.4	Analyse, assess and review regularly harvest data in removal passes	FDPM, State Forest Departments	Sharing of analysed and assessed harvest data between state and federal agencies	CITES export permits					
Action 2.1.5	Determine the period for the collection of planting stocks	FRIM	A collection plan is available	Records of past flowering and fruiting trends, drought trends					
Outcome 2.2	Monitoring of *Aquilaria* in the PRFs is enhanced								
Action 2.2.1	Develop monitoring protocol guidelines to assess harvest impacts	FRIM	Application of the guidelines at the state level	Data sheets					

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Action 2.2.2	Promote use of karas in enrichment planting and rehabilitation of degraded sites	FRIM, FDPM, State Forest Departments	The use of *karas* trees in enrichment planting and rehabilitation of degraded sites is increased	Purchase records, transfer records					
Action 2.2.3	Conduct stakeholders' dialogues to improve adaptive management	FDPM, State Forest Departments	Increased commitment by stakeholders to collectively address threats	Dialogue reports, finance records					
Objective 3	**Enhance the production of artificially propagated *Aquilaria malaccensis***								
Outcome 3.1	The harvesting pressure on wild populations is significantly reduced								
Action 3.1.1	Promote the cultivation of parental stocks by increasing the areas dedicated to such cultivation in state or private land. Designate these areas as seed production areas and genebanks	State Forest Departments, MTIB	Seed production areas and genebanks established	Road shows, number of areas designated for such purpose in private land or village gardens					
Action 3.1.2	Encourage local communities to designate trees in their villages/farms as genebanks	MTIB	Village genebanks established	Road shows					
Action 3.1.3	Develop effective and cheap propagation techniques, including a protocol to record the origin of stocks, to increase availability of planting stocks	FRIM	Propagation and agronomic protocols are available for use	Workshop notes, draft protocols					
Action 3.1.4	Develop appropriate agronomic practices at plantation/farm level	FRIM, MTIB							

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Action 3.1.5	Certify the quality of planting stocks through registration or certification mechansim	MTIB	Registration/certification mechanism is in place	Minutes of meetings, draft regulations					
Objective 4	**Enhance research and development related to *in situ* and *ex situ* conservation and selection for superior stocks**								
Outcome 4.1	Sufficient germplasm material from representative populations is conserved and utilised for R&D and CEPA programmes								
Action 4.1.1	Identify and designate seed provenance areas in the natural forests as genebanks	State Forest and Wildlife Departments	Genebanks and seed provenance areas established in PRFs, wildlife sanctuaries and state parks	Minutes of meetings					
Action 4.1.2	Designate and establish suitable areas in relevant states as karas arboretum to support genebanks	State Forest Department	At least two arboreta established, one for each region	Minutes of meetings					
Action 4.1.3	Investigate demographic patterns for *Aquilaria hirta*	FRIM	Proposals to conduct such studies are approved and funded	Draft proposals, reports of field work					
Outcome 4.2	The problem of unpredictable quality and quantity of harvest in the plantation/agro-industry is reduced								
Action 4.2.1	Conduct selection and breeding programmes using the above genebanks to enhance the quality of planting materials	FRIM	Proposals to conduct such studies are approved and funded	Draft proposals, reports of field work					
Action 4.2.2	Investigate the potential production of gaharu at plantation scale and related costs and benefits	FRIM, MTIB	Proposals to conduct such studies are approved and funded	Draft proposals, reports of field work					

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Objective 5	**Enhance enforcement at national and state levels**								
Outcome 5.1	The frequency of illegal harvesting is reduced significantly								
Action 5.1.1	Monitor regularly representative populations including those in genebanks and protected areas	State Forest and Wildlife Departments, public and private owners	Monitoring reports are available	Monitoring reports, field work claims					
Action 5.1.2	Apply DNA profiling technologies for identification of species, population and individuals	FRIM, State Forest and Wildlife Departments, private and public landowners	Staff of State Forest and Wildlife Departments are trained to use these technologies	Workshop modules comprising lecture and practical sessions					
Action 5.1.3	Enhance enforcement capabilities, assets and manpower resources in respective agencies	Enforcement agencies at federal and state levels	Respective agencies are better equipped with trained manpower and assets when conducting raids	Number of successful raids					
Action 5.1.4	Increase patrolling frequency and intensity in sensitive areas	Enforcement agencies at federal and state levels	More frequent patrolling in sensitive areas	Field reports					
Action 5.1.5	Enhance cooperation between state authorities and federal enforcement agencies such as Customs, Immigration, Maritime, Police and Army Units	Enforcement agencies at federal and state levels	Intelligence networking is improved significantly	Regular uptake of intelligence data					
Action 5.1.6	Improve governance along harvest process and chain of custody	State Forest Departments, private and public landowners	Harvest process and chain of custody complies with existing regulations	Compliance reports					

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Objective 6	**Enhance the enabling factors to improve the resilience of extant populations to harvesting**								
Outcome 6.1	Enhanced facilitation of enabling factors increases the resilience of extant populations to harvesting impacts								
Action 6.1.1	Support R&D activities that aim to improve understanding of the impacts of harvesting on wild populations	NRE, MPIC	Proposals to conduct additional studies are approved and funded	Draft proposals, reports of field work					
Action 6.1.2	Monitor the chain-of-custody through a registration mechanism	MTIB, NRE	Monitoring mechanism established	Monitoring reports, field work claims					
Action 6.1.3	Analyse and review regularly the export data for market and harvesting trends	MTIB, NRE	Regular analysis of export volume, trend etc is available	Analyses reports					
Action 6.1.4	Consider *karas* as the country's third major plantation commodity to enable more concerted efforts to be channeled into species conservation and development of the industry	MPIC, MTIB	Karas is regarded as the country's third major commodity	Minutes of meetings/ discussions					
Action 6.1.5	Enhance financial incentives and enabling procedures for the setting up of plantations	MoF, MPIC, MTIB	Increased financial incentives\ to small holders and plantations is declared by GoM	Minutes of meetings/ discussions					
Action 6.1.6	Consider collection of cess and royalties from plantations	MTIB, NRE	Initial discussion on the possibility of charging cess and royalties are initiated	Minutes of meetings/ discussions					

Objectives and Outcomes		Implementing agencies	Indicators	Means of verification	Timeline				
					2016	2017	2018	2019	2020
Action 6.1.7	Encourage further use of the reward system for information at state level	Enforcement agencies at federal and state levels	The number of reward cases in each state surpasses five	Reports					
Action 6.1.8	Strengthen networking between relevant states and federal agencies, including the sharing of data	FRIM, State Forest and Wildlife Departments, private and public landowners	Data analyses are available	Minutes of meetings/ discussions					
Action 6.1.9	Conduct CEPA programs particularly for local communities	State Forest and Wildlife Departments, private and public landowners	More village genebanks are established	Number of village genebanks and number of road shows					

Abbreviations

CEPA	-	Communication, Education and Public Awareness
CITES	-	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DNA	-	Deoxyribonucleic acid
FDPM	-	Forest Department Peninsular Malaysia
FRIM	-	Forest Research Institute Malaysia
GoM	-	Government of Malaysia
MoF	-	Ministry of Finance
MPIC	-	Ministry of Plantation Industries and Commodities
MTIB	-	Malaysian Timber Industry Board
NRE	-	Ministry of Natural Resources and Environment
PRFs	-	Permanent Reserved Forests

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Annex 1. Media reports on the illegal harvest of *Aquilaria malaccensis* referred here as *gaharu*.

THE STAR ONLINE

Community

Illegal foreigners scour forest in search of agarwood

THE STAR ONLINE

Community

Illegal poachers coming for the trees cultivated in Johor forests

Gaharu thefts in Johor forests

Perhilitan nab 2 Vietnamese men for encroachment

'Gaharu' poachers held

Adenan: Thais caught in protected areas


THE STAR ONLINE

Nation

Gaharu trees felled illegally


THE STAR ONLINE

Nation

Vietnamese punished for chopping down gaharu – a first in Penang


THE STAR ONLINE

Nation

13 Viets held for stealing agarwood


THE STAR ONLINE

Nation

Runners come across men cutting down trees in Penang park

THE STAR

Nation

Viets held over agarwood theft

THE STAR

Archives

Foreigners illegally harvesting trees from Sabah forest reserves

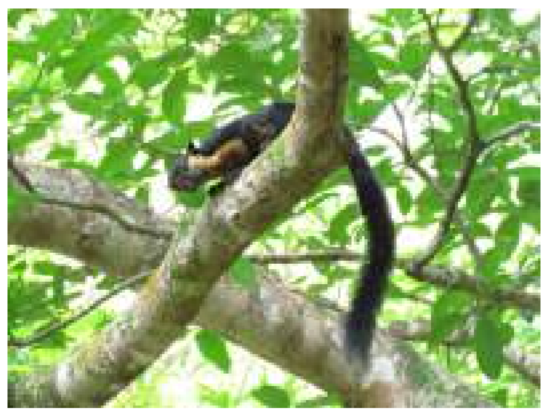
Gaharu thieves' mini village was the 'perfect hideout'

Annex 2. Mass media report of financial subsidies being available for *karas* plantation schemes.


RM3 juta buka ladang kayu gaharu

Annex 3. Predators of *Aquilaria malaccensis*.

Macaca fascicularis (Cercopithecidae)



Ratufa bicolor (Sciuridae)

Callosciurus prevostii (Sciuridae)

Heortia vitessoides (Crambidae)
(Photo credit: Ong Su Ping)

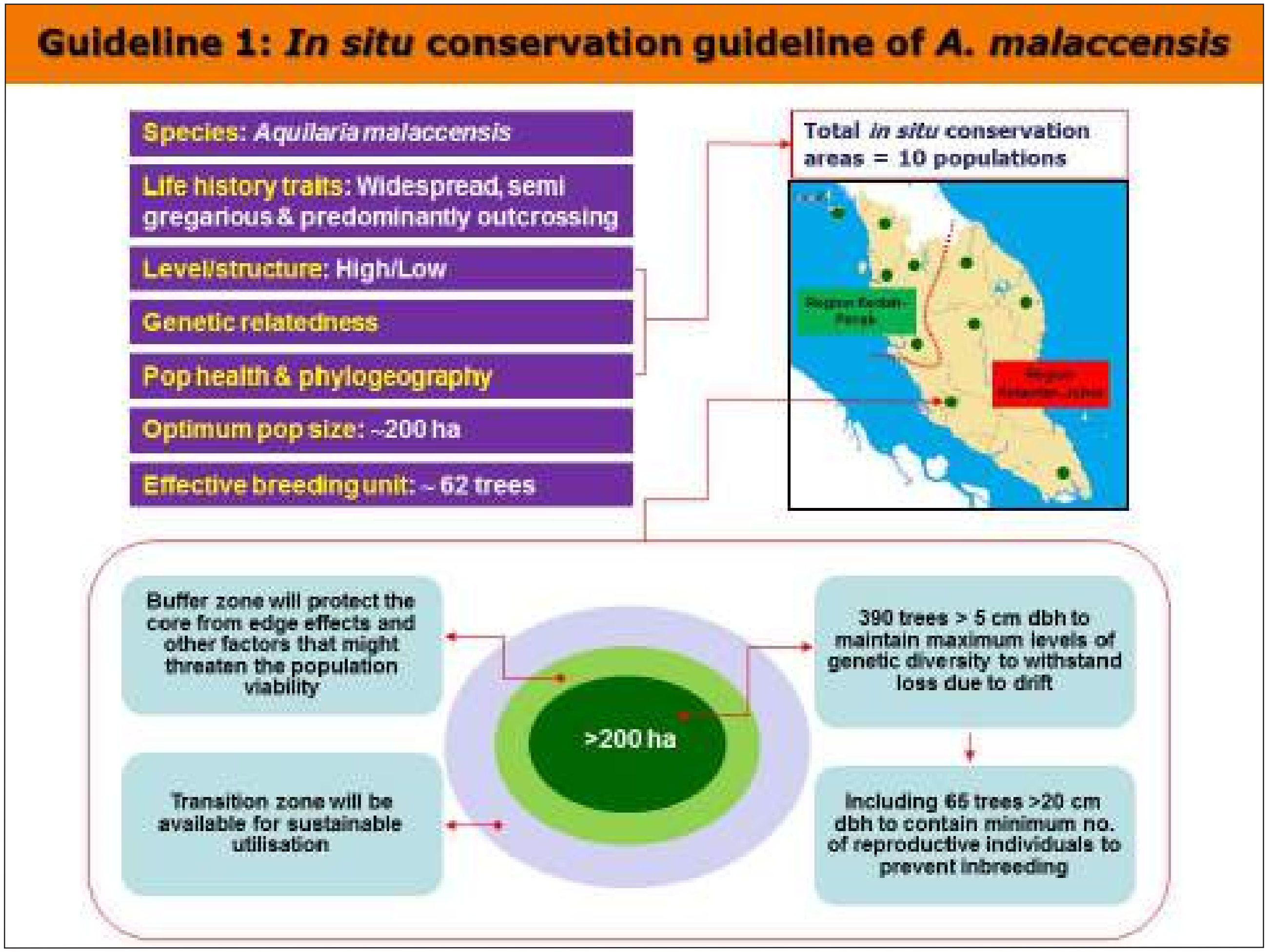
Pitama hermesalis (Crambidae)
(Photo credit: Ong Su Ping)

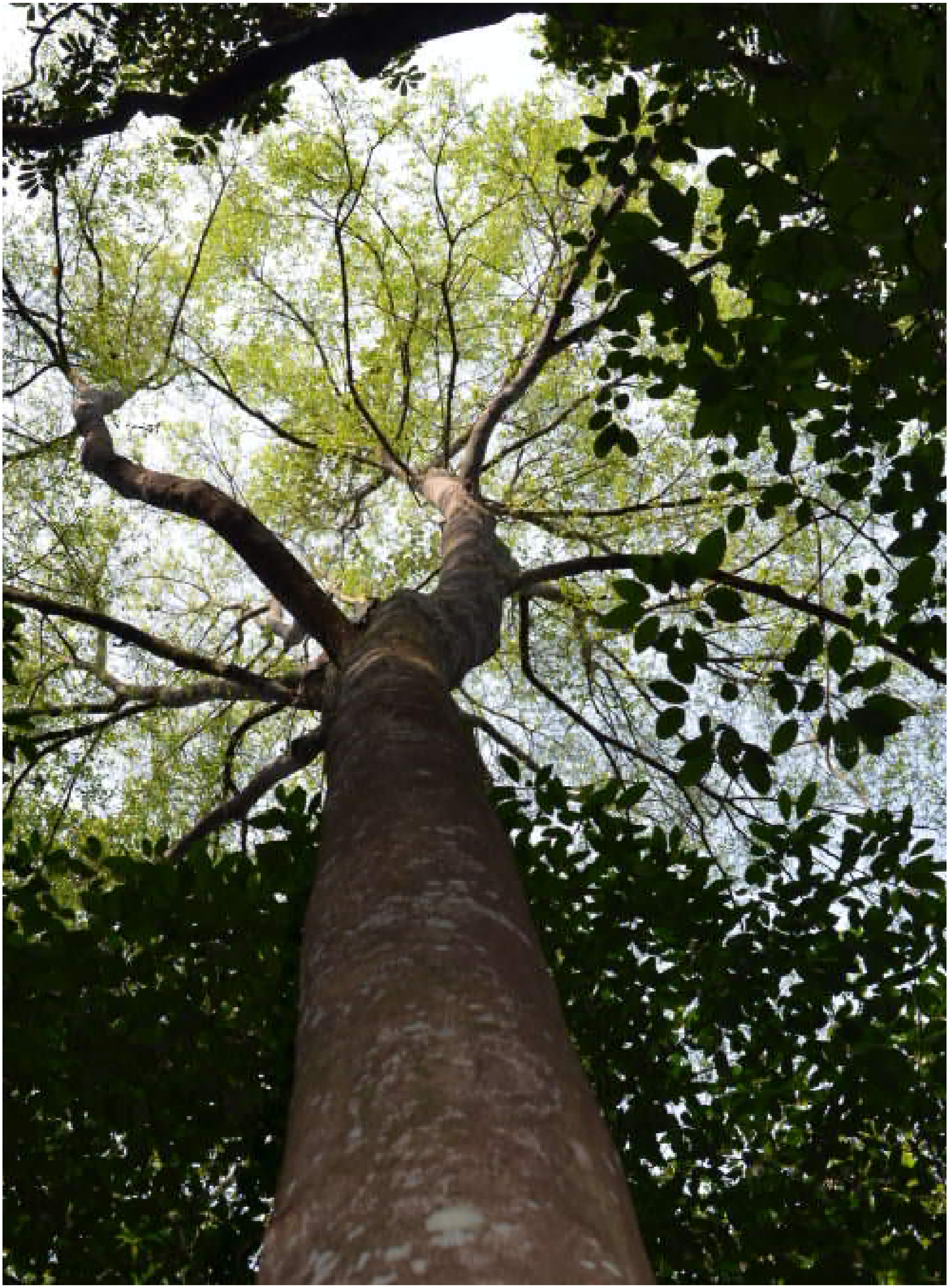
Exuvia of *Zuezera sp*. (Cossidae) on a tree trunk (Photo credit: Ong Su Ping)

Scale insects of the family Diaspididae
(Photo credit: Ong Su Ping)

Whitefly of the family Aleyrodidae
(Photo credit: Ong Su Ping)

Annex 4. The protocol for the selection of representative populations of *Aquilaria malaccensis* in the peninsula for the purpose of conservation.





Outreach Action Plan of the *Aquilaria malaccensis* Arboretum 2022–2031:

An Early Concept

Lau Kah Hoo
Lillian Chua Swee Lian
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MS ISO 9001: 2015

Design and typeset: Siti Fariezza Khairi Thaw

Set in Calibri 12

Printed by Forest Research Institute Malaysia, Kepong

Frontispiece: Staff planting at the Selangor arboretum. Photo: Siti Fariezza Khairi Thaw.

CONTENTS

ACKNOWLEDGEMENTS

The ‘Outreach Action Plan of the *Aquilaria malaccensis* Arboretum 2022–2031: An Early Concept’ was one of the publications derived from the project ‘Establishment of Arboreta and Strengthening Institutional Network for the Conservation of *Aquilaria malaccensis* in Peninsular Malaysia’ funded by the European Union through the CITES Tree Species Programme.

The authors would like to thank several researchers behind the production of ‘Conservation Action Plan For The Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) In Peninsular Malaysia’, which had served as the backbone of this document; Dr. Lee Soon Leong, Nurul Farhanah Zakaria, Dr. Tnah Lee Hong, Dr. Lee Chai Ting, Dr. Ng Chin Hong and Dr. Kevin Ng Kit Siong.

We would like to express our gratitude to the CITES Secretariat, especially to Dr. Haruko Okusu (Chief, Outreach and Projects Unit), Dr. Milena Sosa Schmidt (CITES Tree Species Programme Coordinator), and Mr. Thang Hooi Chiew (Regional Coordinator for Asia) for their tireless guidance in making the project a successful programme. Also to Siti Fariezza Khairi Thaw who assisted in the book typesetting, and all the project team members.

Lastly, we thank the Ministry of Energy and Natural Resources of Malaysia for their continuous support in the project, both administratively and financially.

GLOSSARY

karas - Local name for the tree species *Aquilaria malaccensis*. Occasionally, the term is also used to refer to other species from the same genus.

gaharu - The resin produced by the species as a result of chemical interactions between the tree and foreign particles that entered into the tree.

1.0 What is an arboretum?

An arboretum is an area set aside to grow and display different kinds of worthy ornamental trees, shrubs, vines and other plants. Arboretum has a scheduled maintenance plan and plants have proper record keeping and labels for reference (Wyman 1960). While it is possible to have as many plant species from each region, it does not necessarily have to include all, nor is it necessarily to have a formal planting arrangement in it. Richmond (1971) regarded an arboretum as "an institution which develops and administers collections of trees and shrubs, arranged in aesthetic harmony with the surrounding landscape, and which conduct programmes based upon these collections for the purposes of public service, education, and research".

The Pahang arboretum (top) and Selangor arboretum (bottom) were established in year 2021 and 2022 respectively. Photo: Siti Fariezza Khairi Thaw and Lau Kah Hoo.

2.0 What is the goal of the plan?

The goal of the plan is to provide user groups with adequate information on the functions and benefits of the arboretum. This is to ensure the users are informed and able to participate in the arboretum activities.

The goal aligns with the Conservation Action Plan For The Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) In Peninsular Malaysia 2016 (CAP) publication (Chua *et al.* 2016), which comprises six objectives with each specifying several actions outlining management and conservation measures. The specific actions are placed under two of the four relevant objectives of this Plan. These are in preparation to bring research and conservation into light, and to become a platform for knowledge sharing, plant material source, communication, education and public offerings.

2.1 OBJECTIVE 1: Develop messages for target user groups on the benefits of the arboretum

Several user groups have been identified of whom can benefit and/or take part in activities derived from the established arboretum:

- Researchers;
- Forest managers;
- Policy makers;
- Plantation owners; and
- General public.

Stakeholders dialogue held in 2015 to gather feedback for the development of the Conservation Action Plan For The Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) In Peninsular Malaysia. Photo: Kevin Ng Kit Siong.

Each of the user groups has their own needs hence the messages will need to be properly defined and tailored to fit the needs and focus of each group. Also as a means to deepen relationships among current user groups and establish new and diverse connections.

2.2 OBJECTIVE 2: Produce relevant publications for information dissemination

Publications such as semi-technical and general type articles are useful especially to the fifth user group (General public) who may not have adequate background on biology. These include leaflets, brochures or any other promotional forms of media print. For the other four user groups (Researchers, Forest managers, Policy makers, Plantation owners), more technical write-ups are appropriate such as books, journal articles and technical bulletins. Notwithstanding that, users of the arboretum can also publish their activities and share them to the community. In order to increase access and impact from such publications, suitable communication platforms and displays need to be available at public areas of FRIM and at the arboretum itself. Broadcasting the updates and other news such as research findings generated from the arboretum is an effective approach to widen the sphere of the audiences.

Conservation Action Plan For The Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) In Peninsular Malaysia, and two more documents produced in 2016. Photo: Lau Kah Hoo.

2.3 OBJECTIVE 3: Organise get-together for user groups to discuss pertinent issues

Under Objective 3, four Actions outlined in Chua *et al.* (2016) were taken up to be further elaborate here. The first is on **Action 2.1.5** Determine the period for the collection of planting stocks; which aims to identify flowering and fruiting seasons of the *A. malaccensis* and subsequently the germination period in order to determine optimum seeds/seedlings collecting time. As more planting stocks are gathered, these materials could be distributed to interested parties under **Action 3.1.2** Encourage local communities to designate trees in their villages/farms as gene banks. The Plan encourages the use of native agarwood species to be planted instead of introduced species. As more gene banks are established, either through new or existing farms or through homegardens, the species could be saved from the risk of extinction (Saikia & Khan 2012). Under **Action 6.1.8** Strengthen networking between relevant state and federal agencies, including the sharing of data, is where formal discussions between government agencies could be initiated. This could be a platform where conservation issues for the species could be discussed, and if needed solution findings. Local communities could benefit from the arboretum through **Action 6.1.9** Conduct Communication, Education and Public Awareness (CEPA) programmes particularly for local communities. This can be achieved through the organization of various learning activities specifically for children, adults and educators. Programmes for volunteers or interns can be developed to meet specific objectives. Joint ventures and collaborations with community groups and other institutions are a good start. This can include both onsite (e.g. tree characters learning, phenology) and offsite (e.g. class teaching, virtual tour) arboretum programmes. Harum & Moestrup (2014) included, among others, arboretum as a place for recreation, wildlife habitat, city's green lung and provide aesthetic values to the surrounding environment. Green area for therapeutic purposes has of late evolved into a popular trend and benefit gained from 'forest bathing' is tremendous (Wen *et al.* 2019).

A field trip was organised to collect seedlings of *Aquilaria malaccensis* in 2019. Photo: Lau Kah Hoo.

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2.4 OBJECTIVE 4: Plan and conduct research & development activities

Formal scientific research and development activities are included under here. To achieve this objective, participation from other agencies, academic institutions and experts is highly anticipated and crucial. Under Objective 4, six Actions outlined in Chua *et al.* (2016) are seen to be potentially realized and achieved. First is **Action 4.1.2** Designate and establish suitable areas in relevant states as *karas* arboretum to support gene banks, which is well on track with the establishment of two arboreta in Pahang and Selangor between years 2021 and 2022. Nevertheless, more arboretum can be established in other states depending on sites and funds availability. The main objective of the arboretum is to conserve the genetic diversity of *A. malaccensis* but as time goes by, more research can be conducted when the trees have established. As seedlings used in the arboretum originated from nine different populations, association study and provenance trial can be carried out. At molecular level, tree genomic study can be used to expand the genetic application such as to identify resistant and growth genes and to verify genetic contamination. Develop long term tree improvement programmes under **Action 4.2.1** Conduct selection and breeding programmes using the above gene banks to enhance the quality of planting materials is important in preparing agarwood as a commodity species in the future. Cost is an important element that need to be factored in large scale planting hence **Action 3.1.3** Develop effective and cheap propagation techniques, including a protocol to record the origin of stocks, to increase availability of planting stocks and **Action 3.1.4** Develop appropriate agronomic practices at plantation/farm level helps in paving a clear direction towards achieving a reduced long-term expenses goal. As such, the established arboreta will function as an experimental ground to improve propagation techniques. A feature that could add value to the chain-of-custody is to develop a certification system. This falls under **Action 3.1.5** Certify the quality of planting stocks through registration or certification mechanism. Important aspects to be incorporated are origin of the seedlings, type of material collected (seed or seedling) and date of collection. With all these in order, **Action 4.2.2** Investigate the potential production of *gaharu* at plantation scale and related costs and benefits could be implemented to study the species' prospect as a commodity species.

An intern helped with segregating flowers collected from seed traps placed under mother trees of *Aquilaria malaccensis*. Photo: Lau Kah Hoo.

Table 1. Summary of Actions from Chua *et al.* (2016) as applied in the Plan.

Actions	Descriptions	Plan Objectives
2.1.5	Determine the period for the collection of planting stocks	3
3.1.2	Encourage local communities to designate trees in their villages/farms as gene banks	3
3.1.3	Develop effective and cheap propagation techniques, including a protocol to record the origin of stocks, to increase availability of planting stocks	4
3.1.4	Develop appropriate agronomic practices at plantation/farm level	4
3.1.5	Certify the quality of planting stocks through registration or certification mechanism	4
4.1.2	Designate and establish suitable areas in relevant states as *karas* arboretum to support gene banks	4
4.2.1	Conduct selection and breeding programmes using the above gene banks to enhance the quality of planting materials	4
4.2.2	Investigate the potential production of *gaharu* at plantation scale and related costs and benefits	4

Actions	Descriptions	Plan Objectives
6.1.8	Strengthen networking between relevant state and federal agencies, including the sharing of data	3
6.1.9	Conduct CEPA programmes particularly for local communities	3

3.0 Plan implementer

The successful implementation of the Plan can only be achieved through participation from various agencies and stakeholders. As the implementers could also be the users, the give and take concept is key to a sustainable and long-term plan. These groups of implementers and users are not subjected to only a specific objective, but interchangeably (Figure 1).

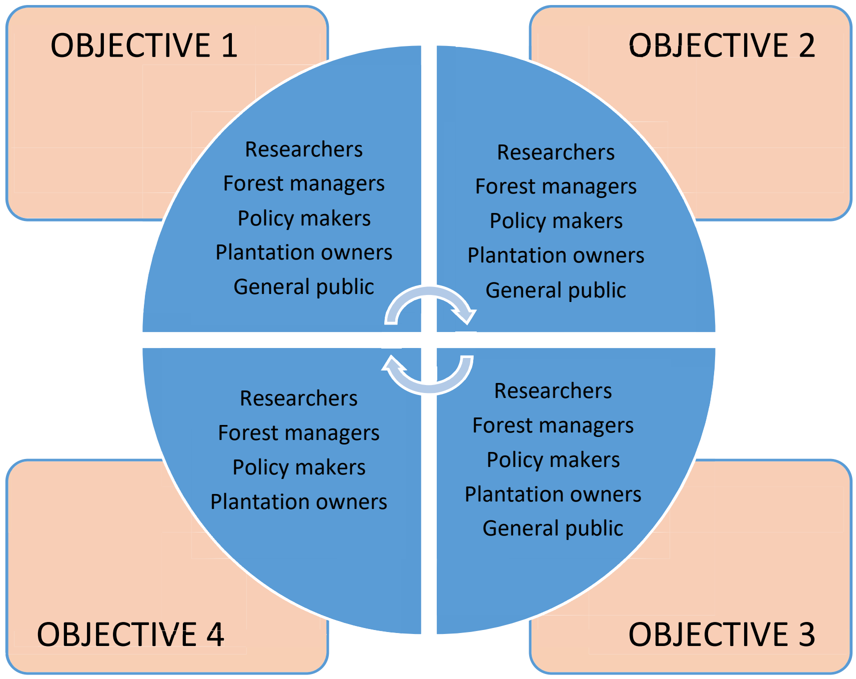

Figure 1. The implementers and users of the plan works in a cycle and not restricted to only one objective.

Researchers: Forest Research Institute Malaysia (FRIM), universities, Non-Governmental Organisation (NGO)
Forest managers: Forestry Department of Peninsular Malaysia (FDPM), state forestry departments
Policy makers: Malaysian Timber Industry Board (MTIB), various ministries
Plantation owners: Government or private plantation owners
Public: Individuals or companies

4.0 Financial sustainability

The sustainable of the arboretum is of paramount knowing of its huge benefits. New funding opportunities need to be continuously explored to sustain the arboretum, either from foreign or local funding agencies. New research grants has to be assessed periodically to secure adequate funding to conduct various research activities. While larger grants are needed for research and development, it is also important to establish appropriate smaller funding plans for infrastructure improvements as well as for ongoing repair and maintenance expenses.

5.0 Pest control and biodiversity monitoring

The best approach for controlling pest is through Integrated Pest Management (IPM). The idea of IPM in this context includes controlling of pests mechanically and naturally, without the use of pesticides. As such, we promote the principle of work with Mother's Nature web of life to control pest outbreaks. The use of fertilizers is also not encouraged, as the ultimate objective of the arboretum is to test the tree performance from different region. Invasiveness from surrounding plants are monitored to prevent outbreak through monthly inspection. Being an outcrossing species, the presence of pollinators are a critical part of *A. malaccensis* reproductive cycle. As such, the site's faunal composition is a key resource and visceral component to a healthy arboretum. Nevertheless, small mammals such as squirrels and macaques have been recorded in natural forests to have disturbed in the flowering and fruiting stages.

Squirrel from the species *Callosciurus prevostii* has been recorded to prey on *Aquilaria malaccensis* fruits. Photo Lau Kah Hoo.

6.0 Outreach Action Plan

The proposed objectives, activities and timeline in the Outreach Action Plan is given in Table 2. The proposed timeline is from 2022 until 2031 over a duration of 10 years taking into consideration the estimated growth rate of the newly planted *A. malaccensis* seedlings to reach maturity at their fifth year (Chua *et al.* 2016; Lok & Yahya 2016). Although expected to go beyond 2025, the plan is in line with the National Policy on Biological Diversity 2016–2025 Goal 1 Target 1: By 2025, more Malaysians are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably, Goal 1 Target 2: By 2025, the contributions of indigenous peoples and local communities, civil society and the private sector to the conservation and sustainable utilization of biodiversity have increased significantly, Goal 3 Target 9: By 2025, the extinction of known threatened species has been prevented and their conservation status has been improved and sustained. The plan itself is dynamic in nature and the activities, timelines and their implementation are to be reviewed over time.

Table 2. Proposed objectives, activities and timelines in the plan.

		Timeline									
Objective	**Activity**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
Objective 1											
Develop messages for target user groups on the benefits of the arboretum	Identify user groups whom can benefit from the arboretum										
	Define specific messages for each user groups										
Objective 2											
Produce relevant publication for information dissemination	Publish technical publication										

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		Timeline									
Objective	**Activity**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
	Publish journal publication										
Objective 3											
Organise get-together for user groups to discuss pertinent issues	Phenology monitoring for planting stocks collection										
	Pest control and biodiversity monitoring										
	Distribute planting stocks to interested individuals for										

		Timeline									
Objective	Activity	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
	gene banks start-up										
	Organise meetings with government agencies to discuss conservation and management issues										
	Organise learning activities specifically for children and adults										

		Timeline									
Objective	**Activity**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
	Organise learning activities specifically for students and educators										
	Explore new grants and funding opportunities										
Objective 4											
Plan and conduct research & development activities	Establish *karas* arboretum to support gene banks										

		Timeline									
Objective	Activity	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
	Conduct selection and breeding programmes										
	Develop effective , cheap and reliable propagation technique										
	Develop advance agronomic methods at plantation level										

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		Timeline									
Objective	**Activity**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
	Develop a registration or certification system for planting materials										
	Conduct studies on the potential of *karas* as a commodity species										

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Input for UNEP WCMC

The scientific basis by which Malaysia established that exports of *Aquilaria malaccensis* are not detrimental to the survival of the species concerned and are compliant with Article IV of CITES:

1. Population of *A. malaccensis* in the wild is determined in accordance with the findings of the **Fourth National Forest Inventory** (NFI-4) published in 2014. The export quota for year 2015 onwards is then calculated based on the standing stock (diameter > 30cm; excluding protected forest) and cutting cycle of 50 years. Only an approximate of 10% of the agarwood tree population contain the *gaharu* resin. **Using the more conventional and 'Cautious Harvest Quota Determination' since 2008, Department of Forestry Peninsular Malaysia, has used these fundamentals for the scientific methodologies of NFI-4 and NFI-5. The findings of both these inventories has shaped the policies taken by Malaysia. Based on the latest inventory (NFI-5), the proposed quota for year 2024 is 5,000 kg.**

   Source: Fourth National Forest Inventory (Peninsular Malaysia) and Fifth National Forest Inventory (Peninsular Malaysia)

2. The government has decided to reduce the pressure on the wild agarwood based on the 2 inventories undertaken (NFI 4 and NFI-5) since 2014. Because *A. malaccensis* is more common and abundant than the other agarwood species, Malaysia have domestically taken a measure to control the trade of Aquilaria spp. (including *A. malaccensis)*. **The last removal pass was given in 2014,** which means **no harvesting of *Aquilaria spp*. from the wild from the forest reserves has been allowed since 2015. In 2021, the Government has undertaken a stricter measure through a national policy to move towards a zero quota for agarwood or the *Aquilaria spp*. for Malaysia.** The trade that is happening now is from the previous stockpile that received removal passes before 2015. In line with the policy, since 2021, the local industry had been consulted via dialogues about quota reduction and has continuously been in achieving zero export quota in the near future.

3. Malaysia has been actively revising our quota and has been reducing our annual export quota, and **targeting to move towards zero export quota from the wild in a few years to come**. Recognizing the need to stabilize the wild population of *A. malaccencis*, the export quota has been decreased gradually since year 2021 as follows:

2009 to 2013 - 2013 – 200,000 kg (*A. malaccensis.*)

2021 – 150,000 kg (*Aquilaria spp.*)

2022 – 50,000 kg (*Aquilaria spp.)*

2023 – 25,000 kg (*Aquilaria spp.*)

(*Reference: Malaysia's quota listing*)

4. Furthermore, in 2016, a 'Conservation Action Plan for the Threatened Agarwood Species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia' was established under ITTO-CITES project to enhance the effectiveness of Malaysia conservation effort for the species.

5. Two *A. malaccensis* arboretum were established in two states: i.e. Pahang and Selangor through CITES Tree Species Programee as *ex situ* conservation approach to preserve the genetic diversity of the species. This arboretum could also act as seed source for plantation industry and lessen the pressure for wild harvesting.

6. With regard to *Aquilaria* **woodblocks** in the export quota, the term block is included in the Glossary of Agarwood Products which was adopted by the Plants Committee at its 20th meeting (Geneva and Dublin, March 2012) and is presented in document CoP16 Inf. 3. The trade term code used for woodblocks is CHP and LOG. In accordance with Resolution Conf. 16.10 on Implementation of the Convention for agarwood-producing taxa, Parties are encouraged to make use of the Glossary as a reference while inspecting and controlling specimens of agarwood products.

Other references:

(i) Chua, L.S.L. (2008). Agarwood (*Aquilaria malaccensis*) in Malaysia. Case study prepared for The International Expert Workshop on CITES Non Detriment Findings. Mexico, 17 – 22 November 2008 (**Appendix 1**)

(ii) Chua, L.S.L., Lee, S.L., Lau, K.H., Nurul-Farhanah, Z., Tnah, L.H., Lee, C.T., Ng, C.H. & Ng, K.K.S. 2016. Conservation action plan for the threatened agarwood species *Aquilaria malaccensis* (Thymelaeaceae) in Peninsular Malaysia. Forest Research Institute Malaysia, Kepong, p.74 (**Appendix 2**)

(iii) Lau, K.H., Chua, L.S.L. & Muhammad Alif, A.A. 2022. Outreach Action Plan of the *Aquilaria malaccensis* Arboretum 2022-2031: An Early Concept. Forest Research Institute Malaysia, Kepong. (**Appendix 3**)

Additional Information:

7. In addition, 3 projects were conducted by the Forest Research Institute Malaysia (FRIM) from 2011-2022 that researched on the phenology, reproductive ecology and population genetics of *A. malaccensis.* Some populations remained to be monitored for phenological activities until today. Data on tagged trees and their localities from forest reserves in Peninsular Malaysia were deposited into Sistem FloraC, a CITES-listed tree species management system developed by Forestry Department Peninsular Malaysia (FDPM).

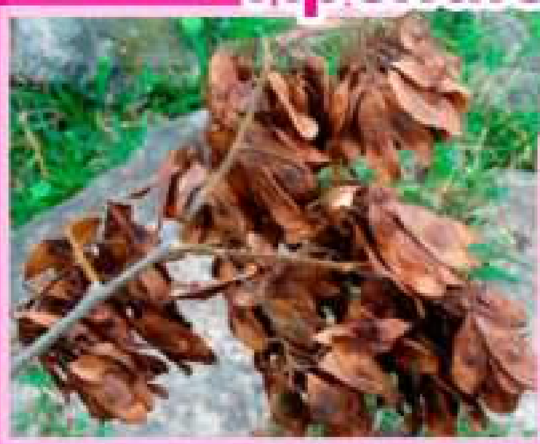
8. In terms of legal protection, other than the domestic CITES law and the Forestry Act at in Peninsular Malaysia, at the same time, in the region of Sarawak, there is an additional legal protection that is given to agarwood through the Wildlife Protection Ordinance 1998, Sarawak Biodiversity Centre Ordinance 1997, National Parks & Nature Reserves Ordinance 1997, Forest Ordinance 2015. Meanwhile in the Sabah region, harvesting of *A. malaccensis* in the wild is prohibited.

Prepared by:

CITES Unit
Ministry of Natural Resources, Environment and Climate Change Malaysia (NRECC)
31 October 2023

Gobierno de Reconciliación
y Unidad Nacional
El Pueblo, Presidente!

República de Nicaragua
Exámen de Comercio Significativo de la Especie *Dalbergia tucurensis* Donn.Sm.
Apéndice II CITES



Managua, agosto 2023

Tabla de contenido

I. Introducción

La Convención sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres, conocida como CITES, es un acuerdo internacional concertado entre los gobiernos, aprobado el 3 de marzo del año 1973 y entró en vigor el 1 de julio de 1975, teniendo como finalidad velar que el comercio internacional de especímenes de especies animales y plantas silvestres no constituya una amenaza para su supervivencia.

Nicaragua se adhirió a esta convención en el año 1977, desde el cual se ha venido implementando, teniendo como base la elaboración de una serie de instrumentos normativos para el cumplimiento de los compromisos contraídos al ratificar esta Convención.

Nicaragua, siendo un país exportador de especies forestales dentro de las cuales se encuentra la *Dalbergia tucurensis*, incluida en el apéndice II de la CITES, le da un énfasis especial al seguimiento y el control de toda la cadena comercial desde su manejo y extracción hasta su exportación, procesos en los cuales participan varias instituciones de gobierno, destacándose Dirección General de Aduanas (DGA), Centro de Trámites de las Exportaciones (CETREX), el Ministerio del Ambiente y de los Recursos Naturales (MARENA) como autoridad Administrativa CITES y el Instituto Nacional Forestal (INAFOR) que ejerce las funciones de asesor científico en los temas forestales.

El presente Informe contiene la evaluación al cumplimiento del Gobierno de Nicaragua en referencia a la Resolución de Conferencia 12.8 (Rev.CoP 17) sobre Examen de Comercio Significativo de Especímenes, Especie del Apéndice II, en donde el Instituto Nacional Forestal (INAFOR) y el Ministerio del Ambiente y de los Recursos Naturales (MARENA) presentan las bases científicas y técnicas para garantizar que la extracción y exportación de la especie *Dalbergia tucurensis* no sea perjudicial para su supervivencia, de conformidad con el artículo VI de la CITES.

II. Descripción taxonómica de la especie

Taxonomía		**Sinónimos de *Dalbergia tucurensis***
Clase:	Magnoliopsida	**Español:** Granadillo, Granadillo rojo, Granadillo amarillo
Orden:	Fabales	
Familia:	Fabaceae	
Género:	*Dalbergia tucurensis* Donn. Sm., Bot. Gaz. 46: 111. 1908; D. *calderonii* var. molinae Rudd	
Nombres comunes:		

Inglés:	Rose wood, palissandre
Español:	Granadillo, Granadillo rojo, Granadillo amarillo

III. Características de la especie

Hábitat

Dalbergia tucurensis es frecuente en bosques perennifolios, caducifolios, sabanas naturales, bosques de galería y de pino encinos en la zona norcentral y del atlántico, en altitudes desde los 40 m hasta los 1200 msnm (Meyrat, 2017).

IV. Características biológicas

El desarrollo de brotes foliares y la plena floración ocurre en febrero y marzo. Hay frutos de marzo a junio y semillas en mayo y julio, con un crecimiento vegetativo que transcurre desde marzo y diciembre y un proceso de defoliación en enero y febrero (Herrera Sosa et al., 2016).

Al florecer *Dalbergia tucurensis* es sumamente atractivo para las abejas facilitando la polinización, con una característica particular que algunos árboles florecen y otros no. Las semillas deben ser manejadas adecuadamente, de lo contrario, se reduce su viabilidad. En el bosque maduro se presenta una regeneración escasa. En sitios intervenidos o fincas se observa una regeneración abundante cerca de los caminos y el borde de carreteras (Meyrat, 2017).

V. Características morfológicas

Según Herrera (Sosa et al., 2018), los árboles miden de 10-25m de altura, el diámetro a la altura del pecho es de 25 a 90 cm aproximadamente. De fuste regular y cilíndrico hasta por lo menos 5m. De copa regular. La corteza es blanco-grisácea, con fisuras verticales.

La madera es pesada. La albura sufre oxidación al exponerse al ambiente, cambiando de color blanquecino a amarillo. El duramen es rojizo-naranja con líneas oscuras al corte. Se observan líneas color café más oscuro y en ocasiones negro, que son los anillos de crecimiento bien demarcados.

El duramen presenta un veteado cromático que sigue los anillos de crecimiento; también se observa la presencia de nudos que contribuyen a crear un diseño llamativo.

Las hojas son alternas, pinnadas, imparipinnadas, foliolos 10 a 15, de 3.5 a 8.5 cm de largo x 1.5 a 4 cm de ancho, elíptico a lanceolado, ápice agudo (algunos redondeados a obtusos), base aguada a obtusa, haz glabracente y envés con abundantes y diminutos pelos adpresos. Las flores cimosas – paniculadas cortas axilares, con flores sésiles o pedicelos de 0.5mm, pétalos blancos, con estandarte levemente reflexo. Los frutos son elípticos, escasamente cubierto con pelos diminutos y apresados, 4.5 a 8 cm de largo y 1.5 a 2.5 cm de ancho (Gonzáles Ñamendy, y Gonzáles Espino, 2023).

VI. Función de la especie en el ecosistema

Se ha reportado que las especies del género D*albergia*, construyen relaciones simbióticas con los rizobios lo que aporta a la fijación de nitrógeno. Esta función juega un papel muy fundamental en los ecosistemas ya que mejoran la fertilidad de los suelos (Linares et al., 2015).

VII. Población

- **Distribución geográfica / extensión de la presencia.**

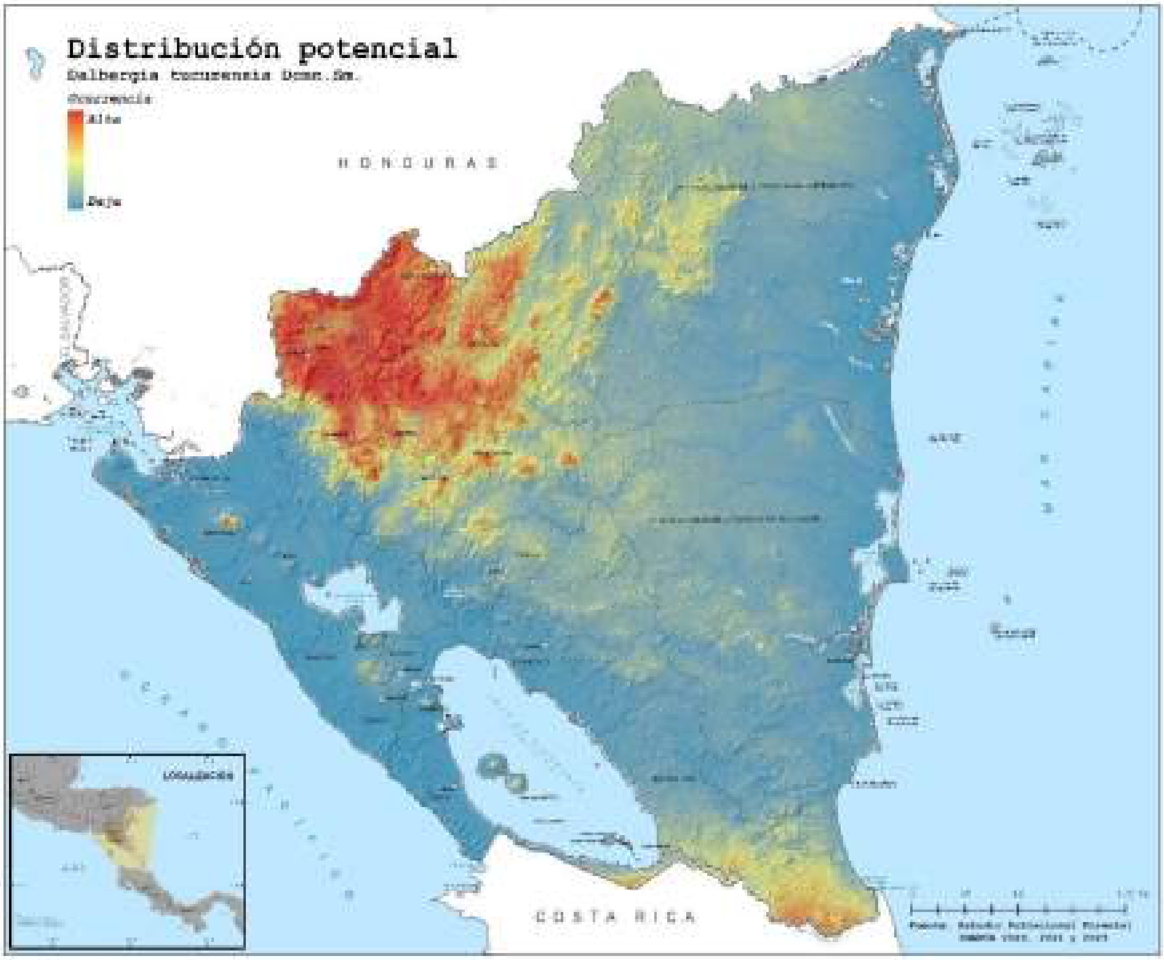
Para Nicaragua, el mapa de distribución natural de la especie *Dalbergia tucurensis* está basado en información climática (temperatura, precipitación, humedad, topografía y estacionalidad) del proyecto WorldClim (http://www.worldclim.org/bioclim), datos compilados y sistematizados por las remediciones del Inventario Nacional Forestal 2019-2022 y datos generados por el Estudio Poblacional de Especies Forestales 2021 y 2023, con 39 puntos identificados de la especie para conocer el hábitat propio y su variación en distribución con aspectos climáticos (zonas de vida), y barreras geográficas.

Para determinar las áreas geográficas potenciales, se construyó un modelo, utilizando máxima entropía (MaxEnt) y álgebra de mapas. MaxEnt,es un programa para el modelado de la distribución geográfica de las especies en base a la máxima entropía, escrito por Steven Phillips, MiroDudik y Rob Schapire, con el apoyo de los laboratorios de investigación de AT&T, la Universidad de Princeton y el Centro para la Biodiversidad y Conservación del Museo Americano de Historia Natural.
130.373,5

Como resultado del modelo, en Nicaragua la especie *Dalbergia tucurensis*, posee una distribución potencial de 3,064,307.069 ha que refiere a un área de distribución del 23.5% a nivel nacional como puede observarse en el cuadro y mapa siguiente:

Tabla 1. Superficie de distribución potencial de *Dalbergia tucurensis*

Presencia de la especie	Área (ha)	(%)
Bajo	1,497,373.305	48.86
Moderado	692,861.454	22.61
Alto	874,072.310	28.52
Total general	**3,064,307.069**	**100**



Mapa 1. Modelo de distribución potencial de *Dalbergia tucurensis*

- **Situación de la población**

Existe una buena población de *Dalbergia tucurensis* en bosques naturales, tanto a nivel de individuos grandes como de regeneración natural, lo que se demuestra con la siguiente información.

- **Estimación de la población.**

Para esta estimación se consideraron los inventarios forestales de dos fuentes:

a) 09 unidades de Muestreo del remuestreo del Inventario Nacional Forestal 2019 al 2023 y b) 27 parcelas del Estudio Poblacional de Especies Forestales del 2021 y 2023; en donde se encontraron individuos de *Dalbergia tucurensis, mapa 2*.


DISTRIBUCIÓN UNIDADES DE MUESTREO INF
Y PARCELAS ESTUDIO POBLACIONAL FORESTAL
SIMBOLOGIA
Unidades de Muestreo
Estudio Poblacional
Áreas protegidas
INAFOR
HONDURAS
COSTA RICA

Mapa 2. Muestreos utilizados como base para establecer el estado poblacional de *Dalbergia tucurensis*

Basado en las dos fuentes de información antes citadas, los principales valores de distribución por clase diamétricas del número de árboles, área basal en m^2 y volumen comercial en m^3 por hectárea se presenta en el siguiente cuadro y gráfico:

Tabla 2. Distribución por clase diamétrica de *Dalbergia tucurensis* en bosque natural latifoliado (INF)

Variable	Clases diamétricas (cm)									Total
	10	20	30	40	50	60	70	80	>90	
Número de árboles por ha	37.05	15.19	6.52	1.99	0.93	0.73	1.13	0.13	0.00	**63.68**
Área Basal m^2 por ha	0.646	0.667	0.531	0.282	0.204	0.229	0.458	0.072	0.00	**3.088**
Volumen m^3 por ha	1.703	2.643	2.451	1.752	1.246	1.691	4.448	0.453	0.00	**16.386**

Existe un aumento del número de árboles y área basal por ha a partir de la clase diamétricas de 10cm. Mientras que en el volumen comercial aumenta desde la clase diamétricas mayor a 70cm, esto demuestra que existen poblaciones de la especie en todas las clases diamétricas y que su aprovechamiento bajo las normativas de manejo sostenible no pone en riesgo a la especie.

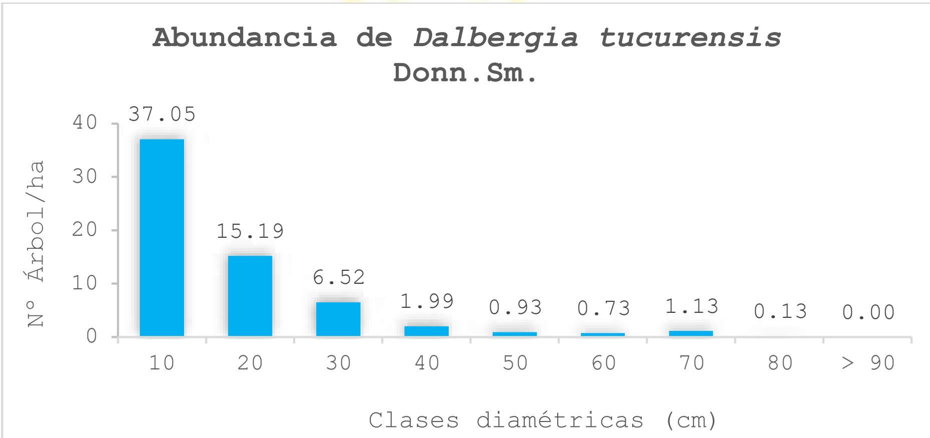


Gráfico 1. Abundancia por clase diamétrica de *Dalbergia tucurensis*

Según la gráfica anterior describe una J invertida, en referencia a abundancia que es peculiar de las especies heliófilas, lo cual es una distribución normal característica de poblaciones en áreas naturales, indicando además que los individuos que se aprovechan en las clases diamétricas por arriba del diámetro mínimo de corta serán reemplazados por individuos de las clases diamétricas inferiores.

- **Tendencias de la población**

La especie de *Dalbergia tucurensis* se encuentra en el apéndice II de la CITES, considerándose amenazada por el comercio internacional y en Nicaragua se hace un aprovechamiento mínimo y no se considera en riesgo o amenazada según la siguiente información que se presenta, tomada del sistema de trazabilidad del INAFOR.

En las tablas 3 y 4, se presentan los datos correspondientes a la cantidad de solicitudes aprobadas y volumen (m^3) aprovechado, según sea Agrosilvopastoriles (SAF), o Planes Operativos Anuales (POA), para el período 2015 al 2022.

Tabla 3. Solicitudes de aprovechamiento y Volumen Extraído en SAF

Descripción	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de Solicitudes aprobadas	0	0	4	1	0	0	0	0	5
Volumen Extraído	0	0	30.84	16.48	0	0	0	0	47.32

Los registros indican un mínimo aprovechamiento en 2017 y 2018 en la modalidad denominada SAF y nulo aprovechamiento entre el 2019 y 2022.

Tabla 4. Solicitudes de aprovechamiento y Volumen Extraído en POA

Descripción	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de Solicitudes aprobadas	1	0	1	0	0	0	0	0	2
Volumen Extraído	169.953	0	210	0	0	0	0	0	379.953

En el caso de los POA que se derivan de Planes de Manejo, también la especie experimenta un aprovechamiento mínimo en 2015 y 2017, y nulo aprovechamiento desde el 2018 al 2022.

Otra modalidad de aprovechamiento son los Permisos Especiales que se otorgan de madera caída por fenómenos naturales, árboles afectados por plagas o aquellos que ponen en riesgo la vida de las personas, u otras.

Los datos que se muestran en la tabla 5, indican un mínimo aprovechamiento de la especie, excepto 2018 que tiene el 64.5% de todo el período, teniendo en los últimos 4 años un bajo aprovechamiento.

Tabla 5. Solicitudes de aprovechamiento y Volumen Extraído de Permisos Especiales

Descripción	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de solicitudes aprobadas	2	0	3	9	8	1	3	4	30
Volumen extraído	29.291	0	15.146	375.919	87.374	20.825	3.094	51.312	582.961

Esta tabla 6 también muestra que Nicaragua está realizando un aprovechamiento mínimo de *Dalbergia Tucurensis* desde el 2015, teniendo como promedio anual 126.3m³ de volumen aprobado.

Tabla 6. Cantidad de volumen en m³ transportados en el período 2015 - 2022 para *Dalbergia tucurensis*

Volumen aprobado	Volumen transportado	Volumen exportado
2015 al 2022	2015 - 2022	2015 al 2022
1,010.2 m³	3,587.7 m³	3,326.67 m³

Los datos de volumen transportados y exportados son remanentes de años anteriores (la durabilidad de la madera permite almacenarla por varios años) y/o de decomisos que fueron subastados y posterior exportado.

VIII. Comercio

- **Legal Internacional.**

Según los registros del Sistema de Trazabilidad de INAFOR, Las exportaciones de la especie *Dalbergia tucurensis* realizadas durante el período 2015-2022 suman un total de 3,326.667 metros cúbicos, con un promedio anual de 415.8331 metros cúbicos, aunque no es necesariamente madera proveniente de aprovechamiento aprobado cada año (según se mencionó en el comentario de la tabla 6) a continuación, se detallan en la siguiente tabla.

Tabla 7. Registro de las exportaciones de *Dalbergia tucurensis* en el periodo 2015 – 2022.

Año	No. permisos de exportación	Cantidad en m³	Cantidad en US$
2015	60	1,319.43	1,583,319.60
2016	11	186.87	224,247.60
2017	21	480.34	576,405.60
2018	12	224.96	269,956.80

2019	32	683.92	820,702.80
2020	8	114.05	136,856.40
2021	24	308.84	370,609.20
2022	1	8.25	9,900.00
Total	**169**	**3,326.67**	**3,991,998.00**

Estas cifras representan el comercio efectivo de la especie, y como puede notarse han sido variables cada año, teniendo 2015 como el de mayor número de permisos de exportación con 60 y 2022 con apenas un permiso.

De acuerdo a los registros de la Autoridad CITES de Nicaragua, las exportaciones de *Dalbergia Tucurensis* en el período 2018 al 2022 fueron de 1,203.346m³, con un promedio anual de 240.67m³.

Tabla 8. Registro CITES de las exportaciones de *Dalbergia tucurensis* en el período 2018 – 2022.

Año	*m³*

2018	207.766
2019	587.555
2020	114.047
2021	285.728
2022	8.25
TOTAL	1203.346

Este dato es similar al que reporta el Sistema de Trazabilidad de INAFOR con 1,340.021m³, cuya diferencia es posible porque los protagonistas solicitan la autorización de INAFOR, pero no realizan el trámite CITES ante MARENA.

- **Control del Comercio Ilegal.**

INAFOR cuenta con una red de 18 puestos de control estratégicamente ubicados que sirven para garantizar el traslado seguro de productos forestales e identificar el comercio ilegal.

Además, se cuenta con la Trazabilidad Forestal, que es un sistema desarrollado en una plataforma WEB, conocida como Code On Time, utilizando una base de datos implementada en SQL 2008, y constituye una herramienta muy importante para conocer los antecedentes de un producto de madera de cualquier sitio del país proveniente de un área autorizada por el ente regulador INAFOR.

A continuación, se presenta el resumen de decomisos de madera de *Dalbergia tucurensis* producto del corte y comercio ilegal, que por los datos se puede considerar muy bajo.

Tabla 9. Resumen de decomisos y volumen incautado de *D. tucurensis*

Descripción/año	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de decomisos				1			1		2
Volumen decomisado (m^3)				9.707 m^3			3.625 m^3		13.332 m^3
Sitios del decomiso				Municipio de Chinandega, departamento de Chinandega			Municipio de Morrito, departamento Río San Juan		

IX. Explicación de cómo la Autoridad Científica (INAFOR) formula un Dictamen de Extracción No Perjudicial (DENP)

El DENP se realiza únicamente en las áreas autorizadas que cuenten con un Permiso de Aprovechamiento Forestal Vigente aprobado y emitido por INAFOR, teniendo como condición previa la aprobación de un Plan de Manejo Forestal, cuya presentación y ejecución está bajo la responsabilidad de los propietarios o de quien ejerza los derechos sobre el mismo. La forma, requisitos y procedimientos para la aprobación de un plan de manejo forestal y la emisión de un permiso de aprovechamiento, son determinadas por el Reglamento de la Ley N°462, **Ley de conservación, fomento y desarrollo sostenible del sector forestal** (Artículo 21).

Así mismo, el INAFOR desde el año 2012 utiliza el Volumen de Corta Anual Permisible (VCAP), para asignar cuotas de aprovechamiento sostenibles anuales del bosque latifoliado, coníferas y específicamente de la especie *Dalbergia tucurensis*, garantizando que el bosque y las especies no alteren su dinámica y distribución ecológica poblacional, en este sentido el INAFOR está dividido administrativamente en 15 delegaciones departamentales y 4 sub regionales.

Las variables utilizadas para obtener el VCAP se detallan a continuación:

- Cobertura forestal por tipo de bosque y municipio.
- Volumen total, comercial por municipio.
- Especies autorizadas por municipio.

- Intensidad de corta.
- Ciclo de corta por tipo, bosque o especie.
- Posibilidad silvícola.

El volumen anual de corta permisible por año que autoriza el INAFOR se fundamenta en la Norma Técnica Obligatoria Nicaragüense para el Manejo Sostenible de los Bosques Naturales Latifoliados y de Coníferas número NTON 18 001 – 01 y NTON 18 001 – 12, así como la resolución administrativa N° 11-2015 que establece las Disposiciones Administrativas para el Manejo Sostenible de los Bosques Latifoliados, Coníferas y Sistemas Agroforestales.

X. Instituciones que participan en la formulación de dictamen de extracción no perjudicial.

De conformidad a la Política Administrativa para el Uso y Aprovechamiento de los Recursos Naturales y Manejo Forestal, publicada en la Gaceta, Diario Oficial N° 141 del 30 de julio del 2012, las instituciones que participan en el proceso de formulación de Dictamen Técnico No Perjudicial:

- Instituto Nacional Forestal (INAFOR) como ente regulador.
- Gobiernos Municipales, ya que es en sus territorios donde geográfica y físicamente se desarrolla la especie.

- Gobiernos Regionales Autónomos del Caribe Sur y Norte, cuando sea el caso.

En el proceso de aprobación, seguimiento y monitoreo participan:

- Ministerio del Ambiente y de los Recursos Naturales (MARENA).
- Instituto Nacional Forestal (INAFOR).
- Alcaldías Municipales, como administradores de sus territorios.
- Gobiernos Regionales (según sea el caso).
- Policía Nacional, en cumplimiento a la normativa de la Contraloría General de la República acerca de los permisos de aprovechamiento de los recursos naturales.
- Ejército de Nicaragua. En cumplimiento a la normativa de la Contraloría General de la República acerca de los permisos de aprovechamiento de los recursos naturales.

El INAFOR con la participación de representantes de las autoridades municipales y gobiernos regionales, en su caso, aprueba o deniega, previa audiencia pública, los Planes de Manejo Forestales en un plazo no mayor de 30 días hábiles. La audiencia pública es convocada por el INAFOR y en ella participan las y los técnicos forestales de las alcaldías municipales y gobiernos regionales autónomos que correspondan. La audiencia pública toma como referencia obligatoria la norma técnica aprobada según el tipo de bosque o el área bajo manejo.

Vencido este plazo el Plan de Manejo se da por aprobado y el solicitante podrá ejecutarlo. En este caso el INAFOR procede a registrar y emitir el permiso correspondiente de forma inmediata. (Artículo 22 Ley N° 462 Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal).

XI. Supervisión de las exportaciones de *Dalbergia* tucurensis por el INAFOR

Nicaragua cuenta con un proceso de supervisión para la exportación de recurso forestal, a partir del sitio de origen del árbol, donde inicia la cadena de custodia, el INAFOR cumple entre sus funciones el control, monitoreo, seguimiento al aprovechamiento y legalidad del recurso forestal conforme los procedimientos establecidos en su legislación.

La Ley N° 462, Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal establece en su artículo 21 que para el aprovechamiento de bosques naturales se requiere un permiso de aprovechamiento emitido por INAFOR, cuya presentación y ejecución estará bajo la responsabilidad de los propietarios del bosque o quien ejerza los derechos del mismo. De igual forma el artículo 38 del Reglamento de la Ley (Decreto 73-2003) faculta al INAFOR para otorgar permisos de aprovechamiento forestal de una determinada clase de madera, por un volumen determinado y en área determinada. Una vez emitido el permiso el titular y el transportista están obligados a cumplir todos los procedimientos vigentes sobre aprovechamiento y transporte de los productos y/o subproductos forestales que se establecen en el Reglamento, las normas técnicas y disposiciones administrativas para el manejo sostenible de los bosques tropicales latifoliados, de coníferas y plantaciones forestales (artículo 66 del Reglamento).

Una vez autorizado el permiso de aprovechamiento forestal, se debe de cumplir con el proceso de transporte el cual esta regulado en el Decreto 73-2003 en su capítulo V y se ha venido complementando con la Resolución Administrativa DE 33-2013, que establece el procedimiento para la Implementación de la Trazabilidad Forestal; Resolución Administrativa DE 11-2015, que establece las disposiciones administrativas para el Manejo Sostenible de los Bosques Latifoliados, Coníferas y Sistemas Agroforestales; y la Resolución Administrativa DE 13-2015, que establece las Normas administrativas para el funcionamiento de la Industria forestal. Todas estas normativas tienen en común regular y conocer el paso a paso de cada movimiento que ha tenido el recurso forestal que se pretende exportar, brindando de esta manera seguridad y la legalidad de la especie.

A continuación se describe el proceso para dar inicio al transporte de madera a través de la guía de transporte de madera en rollo conforme lo establecido en el capítulo IV de la Resolución administrativa DE 11-2015, *esta guía es única y exclusivamente para trasladar el recurso forestal del sitio de extracción a la industria forestal*, esto en armonía con el artículo 70 del Decreto 73-2003 que ordena que la madera proveniente de bosques naturales deberá ingresar en rollo a una industria registrada en el INAFOR. La emisión de guías se realiza a través del SIRCOF y del sistema de trazabilidad forestal en cumplimiento con lo regulado en el artículo 6 de la Resolución DE 13-2013. La madera en rollo debe ser marcada para su transporte para ello se utilizarán las guías de transporte colocando en los renglones respectivos el número de cada troza, diámetro y longitud. La numeración debe ser consecutiva, con la finalidad de simplificar ((DMayor+Dmenor)²/16X Π x L). Las trozas son codificadas en uno de los extremos con pintura permanente de manera visible, en el caso de madera de coníferas se usa crayón azul o negro y en latifoliada (de aceite) color blanco que permita su identificación. La codificación consiste en señalar la marca del productor, número de permiso forestal, número de la troza, número de guía forestal (se coloca al momento del transporte hacia la industria utilizando los números enteros finales).

Toda persona natural o jurídica que se dedique al transporte del producto forestal deberá registrar el medio de transporte ante el INAFOR, así mismo debe solicitar al INAFOR un permiso de transporte para el traslado. Cuando se transporte madera en rollo de una industria a otra industria, esto soló aplicará cuando la industria a la que ingresó el recurso no haya realizado procesamiento y deba trasladar a otra que brindará ese servicio, la industria que tiene cargado ese ingreso de volumen deberá generar nuevas guías rollo con destino a la nueva industria previa inspección técnica y autorización del delegado Municipal.

Los productos provenientes del aprovechamiento forestal del bosque natural y plantaciones forestales deben ser transportados a los sitios de transformación, con la guía de transporte forestal y su respectivo certificado de origen, la guía debe ir firmada y sellada por el delegado Municipal que la emite y el Regente Forestal encargado del aprovechamiento.

Cuando se requiera transportar por vía acuática, se utiliza la guía rollo bajo esa modalidad; al llegar al lugar de desembarque se realiza el cambio de guía, señalando los datos del medio de transporte terrestre que utilizara y el número de guía acuática del cual procede. El total de guías acuáticas regresan al expediente del lugar de origen. Las guías terrestres ingresan al sistema del municipio de destino de la madera en rollo con su información completa. Las trozas a transportar vía terrestre se marcan con el nuevo número de guía a utilizar, es decir que cuando el producto forestal transportado utilice las dos vías acuática y terrestre, debe ser marcado en un extremo con la codificación de la guía acuática y en el otro extremo se codifica con guía terrestre.

Para el transporte de madera procesada, la industria forestal es la encargada de generar las guías de transporte e INAFOR realiza el control de guías forestales durante toda la ruta de traslado hasta su destino final. Este control es conforme a las rutas obligatorias y los procedimientos establecidos en Resolución Administrativa No. DE 33-2013, las guías utilizadas para el transporte de madera en rollo hacia la industria forestal deben ser entregadas a la Delegación Municipal del INAFOR de la jurisdicción de la industria como soporte de su informe mensual de ingreso de la industria. Lo mismo aplica para las guías procesadas una vez estas lleguen a su destino final como es el puerto de salida del recurso foresta para exportación.

Una vez agotado el procedimiento de transporte, se da inicio al trámite de la Constancia de Exportación en las distintas modalidades conforme a la CODF 22-2019, que aprueba los procedimientos administrativos para la exportación de madera en rollo, procesada, producto terminado, leña y carbón provenientes de bosque natural, plantaciones forestales y agrícolas, producto forestal leñoso y no leñoso e importaciones, esta normativa recoge 6 modalidades de Constancia de Exportación que previo a su emisión deben cumplir con los requisitos ahí establecidos donde se garantiza toda la cadena de custodia antes descrita.

XII. Procedimientos para la identificación de la especie *Dalbergia tucurensis*

Para la identificación de la especie *Dalbergia tucurensis* se ha tomado como base los siguientes documentos:

- Manual Regional para la Identificación de especies arbóreas, US Forest Service.
- Guía de Identificación de CITES – Maderas Tropicales. USAD, US Forest Service, Environnement Canada.
- Propuesta de Estructura de Guía Dendrológica y Fichas de Especies para el III Ciclo del Inventario Nacional Forestal. UNA 2023.
- Para la identificación de madera en patio para subasta se utilizan expertos nacionales asistidos con muestras.

Se han realizado capacitaciones, diplomados, cursos de Identificación de especies arbóreas con técnicos de la autoridad científica (INAFOR), Dirección General de Aduanas, Instituto de Protección y Sanidad Agropecuaria, Ejército de Nicaragua, Policía Nacional, Ministerio del Ambiente y de los Recursos Naturales, Universidad Nacional Agraria.

XIII. Procedimiento establecido por la autoridad administrativa CITES para otorgar el Permiso de Exportación

Inscripción como exportador de Especies Forestales CITES

Las personas naturales o jurídicas que se dediquen al comercio internacional de especies forestales competencia del MARENA deben estar registrados como exportador de especies forestales en el MARENA, Autoridad Administrativa de la Convención CITES. Esta es una disposición que está establecida en el Decreto 20-2017 que establece el Sistema de Evaluación Ambiental de Permisos y Autorizaciones para el Uso Sostenible de los Recursos Naturales.

Solicitud del Permiso de Exportación

El solicitante ya sea persona natural o jurídica presenta solicitud por escrito de registro como exportador de flora ante la Oficina de Atención e Información al Público (OAIP) del MARENA, presentando los siguientes requisitos:

- Formato de solicitud de registro para el comercio internacional.
- Nombre, apellidos y generales de ley del comerciante (persona natural).
- Escritura de Constitución de la Empresa o la última reforma que lleve integrada la constitución de dicha sociedad.
- Certificación del registro mercantil o registro de cooperativas.

- Número RUC y solvencia de la Dirección General de Ingresos (DGI).
- Certificado de matrícula de la Alcaldía Municipal.
- Copia de cédula de identidad de la persona natural del representante legal en su caso.

Verificados los documentos y estando conforme toda la información presentada por el solicitante, la Dirección General de Patrimonio Natural y Biodiversidad del MARENA, emitirá un certificado de registro, el cual tendrá una vigencia de un (1) año. Sí una persona natural o jurídica no realiza ninguna actividad comercial durante (2) dos años subsecuentes, dicho registro quedará invalidado. Este trámite se desarrollará en dos (2) días hábiles.

Del trámite para la obtención de Permiso de Exportación CITES. Para su trámite deberá cumplir con los requisitos siguientes:

a) Estar registrado como exportador de especies CITES ante el MARENA.
b) Presentar una solicitud por escrito ante la Oficina de Acceso a la Información Pública (OAIP) de MARENA, la cual deberá contener:

- Nombre y Dirección del Exportador.
- Nombre y Dirección del Importador.
- País importador.

- Puerto de salida.
- Puerto de entrada del país importador.
- Nombre común y científico de la especie a exportar.
- Volumen a exportar expresado en metros cúbicos.
- Dirección electrónica de contacto.
- Teléfonos de contacto.

Presentar los siguientes documentos en original y copia, para conformar el debido expediente administrativo:

- Constancia de Inspección Técnica para la Exportación de madera, emitida por el Instituto Nacional Forestal (INAFOR).
- Permiso de Aprovechamiento Forestal, aprobado por el INAFOR.
- Las guías forestales autorizadas por el INAFOR para el transporte de madera.
- Factura de venta para la Exportación, debidamente numerada, con pie de imprenta fiscal.
- Según sea el caso, escritura pública de cesión de derechos de extracción de la madera.
- Minuta de pago original y copia del Permiso de Exportación, el cual deberá ser depositado en la cuenta que para tal efecto ha dispuesto la Tesorería General de la República.

Una vez recibida esta información en el MARENA, es analizada y verificada, tanto los formatos de permisos, las cantidades, sitios de extracción, validez de firmas y períodos de vencimiento, sí toda la documentación está conforme, se procede a elaborar el permiso de exportación CITES, el cual es entregado a través de la Oficina de Atención e Información al Público, una vez que el proponente entregue la minuta de pago original del permiso CITES.

Sí la documentación presentada está incompleta o presenta inconsistencias se elabora una carta de denegación, la cual es entregada al proponente a través de la OAIP. Según sea el caso y se requiera, durante el período de revisión y análisis se realizan consultas con la Unidad de Asesoría Legal del MARENA y/o con el INAFOR.

Instituciones que intervienen en el proceso de exportación de la

especie *Dalbergia tucurensis*.

- Ministerio del Ambiente y de los Recursos Naturales (MARENA).
- Instituto Nacional Forestal (INAFOR).

- Instituto de Protección y Sanidad Agropecuaria (IPSA).
- Centro de Trámites para las Exportaciones (CETREX).
- Dirección General de Aduanas (DGA).

XIV. Leyes, lineamientos, normativas y reglamentos

Descripción de las leyes, lineamientos, normativas y reglamentos nacionales o sub nacionales para la especie *Darbegia tucurensis* para el Comercio, Aprovechamiento, Transporte y Exportación.

- Constitución Política de la República de Nicaragua.
- Ley 947, Ley de Reformas parciales a la Ley 290, Ley de Organización, Competencia y procedimientos del Poder Ejecutivo, a la Ley N° 462, Ley de Conservación Fomento y Desarrollo Sostenible del Sector Forestal y Ley N° 862, Ley Creadora del Instituto de Protección y Sanidad Agropecuaria.
- Ley Nº 462: Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal.
- Ley No. 217, Ley General del Medio Ambiente y los Recursos Naturales en su Artículo 78. La introducción al país y la salida del mismo de especies animales y vegetales, sean estas nativas o no nativas, deben ser previamente autorizadas por la autoridad competente, de

acuerdo a los principios y normas consignadas en la legislación nacional, en los tratados y convenios internacionales suscritos y ratificados por Nicaragua.

- Decreto 8-98, Normas y procedimientos para la exportación e importación de especies de flora y fauna silvestre.
- Decreto 20-2017, sistema de evaluación ambiental de permisos de autorizaciones para el uso Sostenible de los Recursos Naturales
- Resolución Ministerial 13-04-13 Procedimiento Administrativo para la obtención del Permiso para el Comercio Internacional de las Especies Forestales competencia del MARENA.
- Resolución Administrativa CODF 22-2019, que aprueba los procedimientos administrativos para la exportación de madera en rollo, procesada, producto terminado, leña y carbón provenientes de bosque natural, plantaciones forestales y agrícolas, producto forestal leñoso y no leñoso e importaciones.

Lineamientos y Estrategias Nacionales

La Política Nacional Forestal establece la modernización del sistema de otorgamiento de permisos, trámites y procedimientos en la obtención de los diferentes tipos de autorizaciones para el aprovechamiento del recurso forestal de forma sostenible.

La Estrategia Nacional de Biodiversidad establece en su lineamiento No. 3: Implementar acciones para la conservación y restauración de la flora, fauna, agua, bosque, dentro y fuera de las áreas protegidas, desde cada localidad, cada comunidad, garantizando el protagonismo ciudadano.

- Plan Nacional de Lucha Contra La Pobreza y para el Desarrollo Humano
- Plan Nacional Forestal.
- Programa Forestal Nacional
- Inventario Nacional Forestal (INF).
- Plan de Ordenamiento Forestal (POF).
- Estrategia Cruzada Nacional de Reforestación.
- Plan de Prevención y Control de Incendios Forestales.
- Decreto N°. 73-2003; Reglamento de la Ley N°. 462, Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal.
- Ley N° 585; Ley de Veda para el Corte, Aprovechamiento y Comercialización del Recurso Forestal.
- Ley Nº 641 Ley Nuevo Código Penal.
- Ley N°. 822; Ley de Concertación Tributaria.
- Decreto N°. 01-2013; Reglamento de la Ley N°. 822 Ley de Concertación Tributaria

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- Acuerdo Ministerial N°. 06-2005; Reglamento Interno de Funcionamiento de la Comisión Nacional Forestal (CONAFOR).
- Normativa de Funcionamiento del Registro Nacional Forestal (INAFOR).
- Reglamento de los Regentes Forestales.
- Resolución Administrativa No. DE-30-2014 INAFOR; Que establece el Reglamento de Auditoria Forestal Externa en Nicaragua.
- Resolución Administrativa CODF 34-2021, Normativa Administrativa para Plantaciones Forestales.
- NTON 18001-12 Normas Técnicas Obligatoria Nicaragüense para el Manejo Sostenible de los bosques Naturales Latifoliados y de Coníferas.
- Resolución Administrativa N° DE 11-2015 INAFOR; Que establece las Disposiciones Administrativas para el Manejo Sostenible de los Bosques Latifoliados, Coníferas y Sistemas Agroforestales.
- Resolución Administrativa N° DE 13-2015 INAFOR; Que establece las Normas Administrativas para el Funcionamiento de la Industria Forestal.

- Resolución Administrativa Nº DE 33-2013 INAFOR; Sobre el Procedimiento Administrativo para la Implementación de la Trazabilidad Forestal.
- Resolución Administrativa CODF 94-2019, que establece los precios de referencia para la aplicación del pago único por derecho de aprovechamiento del recurso forestal a nivel nacional.
- Resolución Administrativa CODF-RI-12-2021, establece las funciones de los Delegados Departamentales, Delegados Municipales, Inspectores Forestales, Supervisores de Puestos de Control y Técnicos de Fomento y Monitoreo Forestal del INAFOR.

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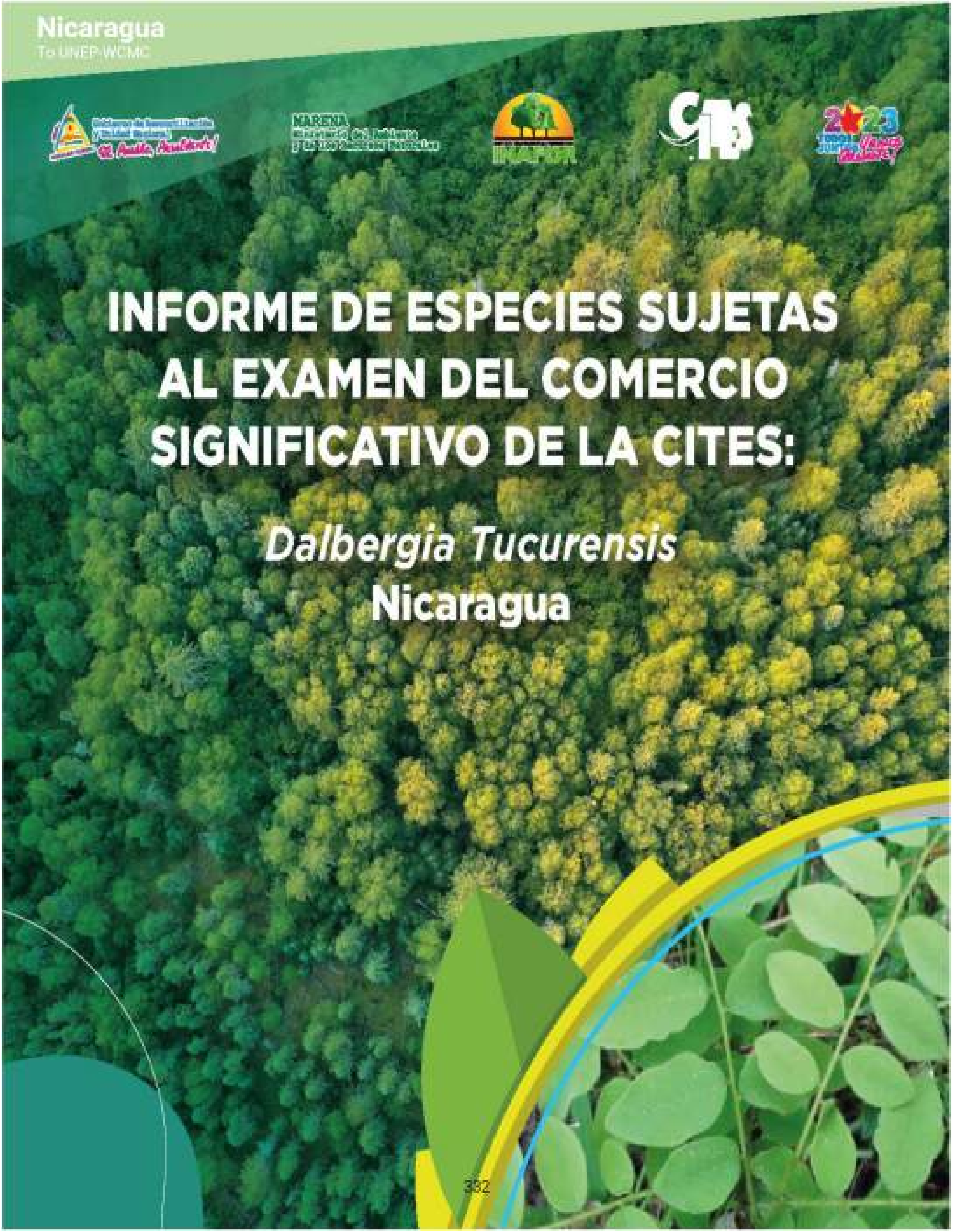
Nicaragua

To UNEP-WCMC

INFORME DE ESPECIES SUJETAS AL EXAMEN DEL COMERCIO SIGNIFICATIVO DE LA CITES:

Dalbergia Tucurensis

Nicaragua



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INFORME SOBRE ESPECIES SUJETAS AL EXAMEN DEL COMERCIO SIGNIFICATIVO DE LA CITES: *Dalbergia tucurensis*

NICARAGUA

Área de distribución en bosques, plantaciones, y áreas protegidas

- **Geográfica / extensión de la presencia.**

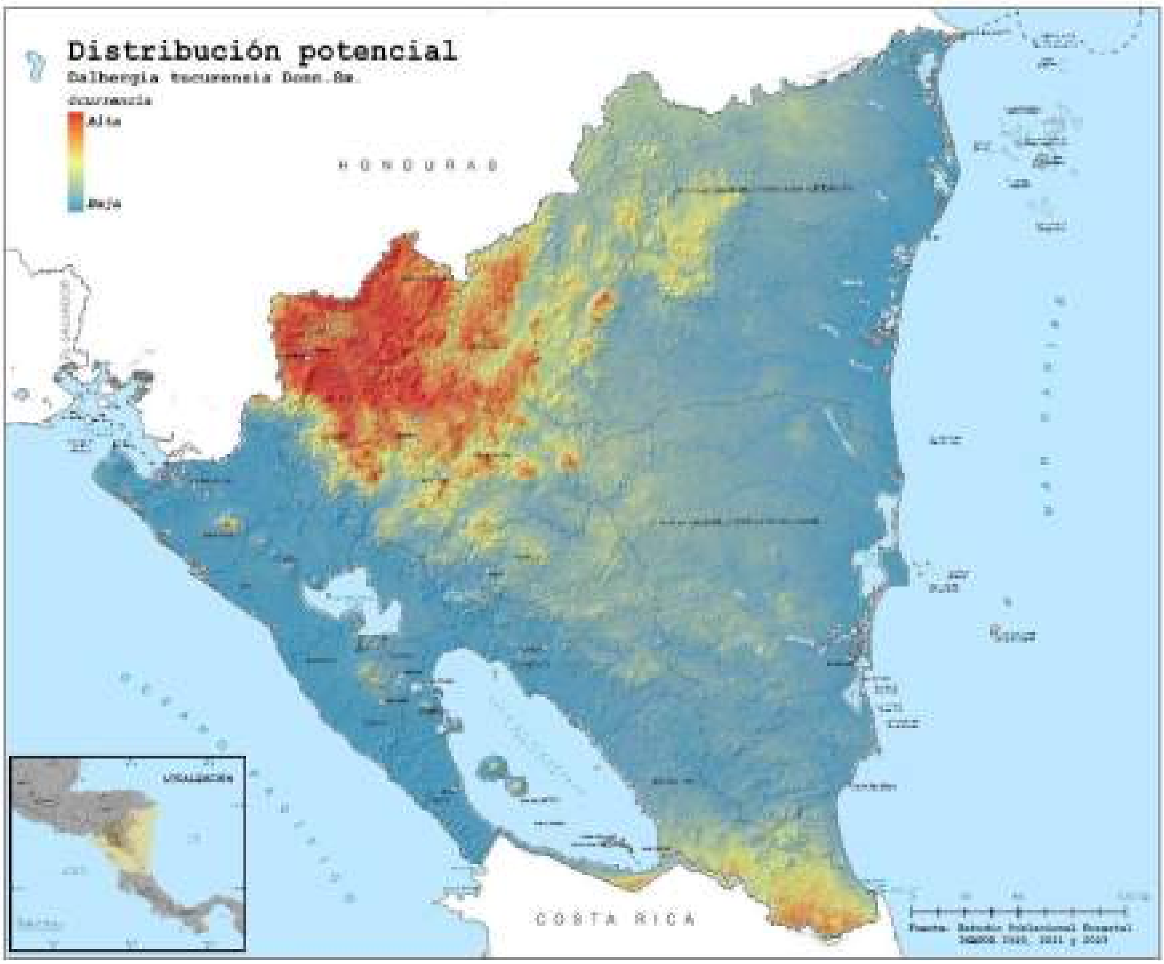
Para Nicaragua, el mapa de distribución natural de la especie *Dalbergia tucurensis* está basado en información climática (temperatura, precipitación, humedad, topografía y estacionalidad) del proyecto World Clim (http://www.worldclim.org/bioclim), datos compilados y sistematizados por las remediciones del Inventario Nacional Forestal 2019-2022 y datos generados por el Estudio Poblacional de Especies Forestales 2021 y 2023, con 39 puntos identificados de la especie para conocer el hábitat propio y su variación en distribución con aspectos climáticos (zonas de vida), y barreras geográficas.

Para determinar las áreas geográficas potenciales, se construyó un modelo, utilizando máxima entropía (MaxEnt) y álgebra de mapas. MaxEnt,es un programa para el modelado de la distribución geográfica de las especies en base a la máxima entropía, escrito por Steven Phillips, MiroDudik y Rob Schapire, con el apoyo de los laboratorios de investigación de AT&T, la Universidad de Princeton y el Centro para la Biodiversidad y Conservación del Museo Americano de Historia Natural.
130.373,5

Como resultado del modelo, en Nicaragua la especie *Dalbergia tucurensis*, posee una distribución potencial de 3,064,307.069 ha que refiere a un área de distribución del 23.5% a nivel nacional como puede observarse en el cuadro y mapa siguiente:

Tabla 1. Superficie de distribución potencial de *Dalbergia tucurensis*

Presencia de la especie	Área (ha)	(%)
Bajo	1,497,373.305	48.86
Moderado	692,861.454	22.61
Alto	874,072.310	28.52
Total general	**3,064,307.069**	**100**



Mapa 1. Modelo de distribución potencial de *Dalbergia tucurensis*

Plantaciones de Dalbergia tucurensis

En el Sistema de Registro Nacional Forestal de INAFOR, se registran 42.54 ha de plantaciones de *Dalbergia tucurensis* con 6,576 plantas en el período del 2019 al 2022. Cabe mencionar que las plantaciones cuentan con otras especies, ver tabla 2.

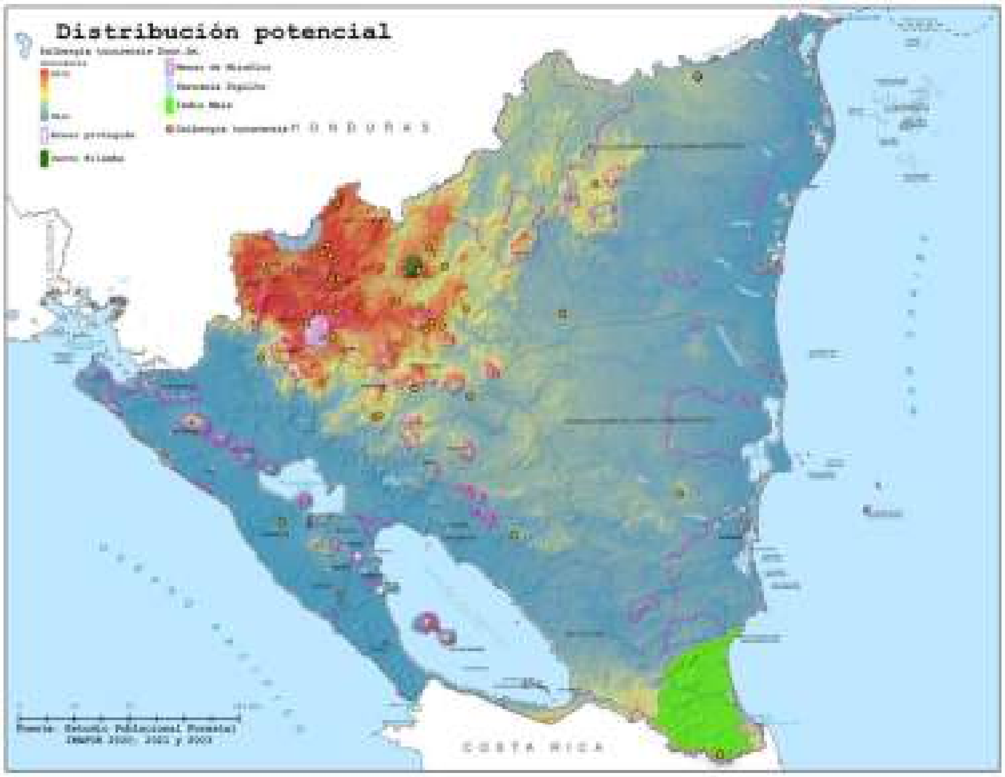
Tabla 2. Plantaciones de *Dalbergia tucurensis* registradas en el sistema de Registro de INAFOR en el período 2019 – 2022.

Departamento/Municipios	Área (ha)	N plantas
Boaco	**6.00**	**2090**
Boaco	2.00	1100
Camoapa	4.00	990
Jinotega	**7.78**	**27**
Jinotega	5.59	16
Santa María de Pantasma	2.19	11
RACCS	**27.76**	**4639**
Bluefields	17.00	2200
Muelle de los Bueyes	0.76	1931
Nueva Guinea	10.00	508
Total general	**41.54**	**6756**

El 66.82% de la superficie plantadas se encuentran en la Región Autónoma de la Costa Caribe Sur, una región que presenta las condiciones edafoclimáticas para el crecimiento de la especie.

Presencia de la especie en Áreas Protegidas

De acuerdo a los registros de la especie en los muestreos forestales realizados del 2019 al 2023, se ha identificado su presencia en dos áreas protegidas: Cerro Kilambé, Serranías de Dipilto y Mesas de Miraflor, ubicadas al norte del país y en la reserva indio – Maíz, ubicada en el noreste de Nicaragua, ver mapa 2.



Mapa 2. *Dalbergia tucurensis* en áreas protegidas

Tamaño, estado y tendencias de la población de *Dalbergia tucurensis* en Nicaragua

Existe una buena población de *Dalbergia tucurensis* en bosques naturales, tanto a nivel de individuos grandes como de regeneración natural, lo que se demuestra con la siguiente información.

- **Estimación de la población.**

Para esta estimación se consideraron los inventarios forestales de dos fuentes:

a) 09 unidades de Muestreo del remuestreo del Inventario Nacional Forestal 2019 al 2023 y b) 27 parcelas del Estudio Poblacional de Especies Forestales del 2021 y 2023; en donde se encontraron individuos de *Dalbergia tucurensis, mapa 3.*

Mapa 3. Muestreos utilizados como base para identificar el estado poblacional de *Dalbergia tucurensis*

Basado en las dos fuentes de información antes citadas, los principales valores de distribución por clase diamétricas del número de árboles, área basal en m^2 y volumen comercial en m^3 por hectárea se presenta en el siguiente cuadro y gráfico:

Tabla 3. Distribución por clase diamétrica de *Dalbergia tucurensis* en bosque natural latifoliado (INF)

Variable	Clases diamétricas (cm)									Total
	10	20	30	40	50	60	70	80	>90	
Número de árboles por ha	37.05	15.19	6.52	1.99	0.93	0.73	1.13	0.13	0.00	**63.68**
Área Basal m^2 por ha	0.646	0.667	0.531	0.282	0.204	0.229	0.458	0.072	0.00	**3.088**
Volumen m^3 por ha	1.703	2.643	2.451	1.752	1.246	1.691	4.448	0.453	0.00	**16.386**

Existe un aumento del número de árboles y área basal por ha a partir de la clase diamétrica de 10cm. Mientras que en el volumen comercial aumenta desde la clase diamétrica mayor a 70cm, esto demuestra que existen poblaciones de la especie en todas las clases diamétricas y que su aprovechamiento bajo las normativas de manejo sostenible no pone en riesgo a la especie.

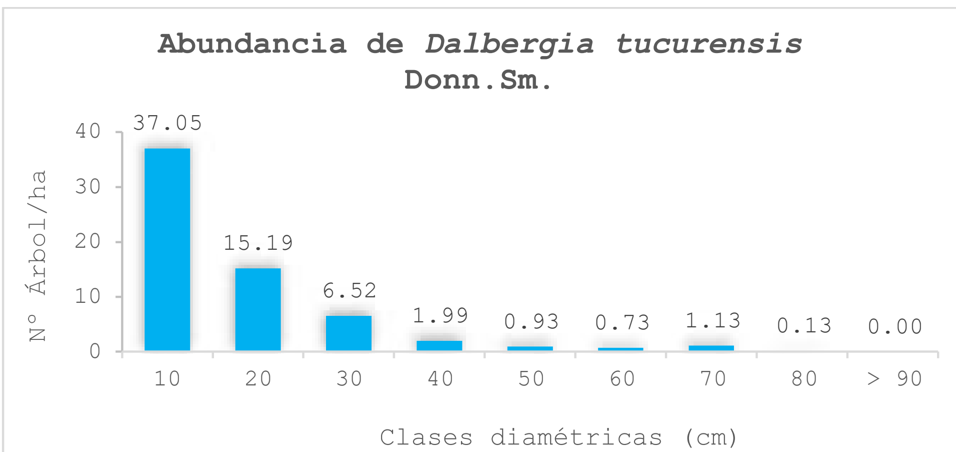


Gráfico 1. Abundancia por clase diamétrica de *Dalbergia tucurensis*

Según la gráfica anterior describe una J invertida, en referencia a abundancia que es peculiar de las especies heliófilas, lo cual es una distribución normal característica de poblaciones en áreas naturales, indicando además que los individuos que se aprovechan en las clases diamétricas por arriba del diámetro mínimo de corta serán reemplazados por individuos de las clases diamétricas inferiores.

Tendencias de la población

La especie de *Dalbergia tucurensis* se encuentra en el apéndice II de la CITES, considerándose amenazada por el comercio internacional y en Nicaragua se hace un aprovechamiento mínimo y no se considera en riesgo o amenazada según la siguiente información que se presenta, tomada del sistema de trazabilidad del INAFOR.

En las tablas 4 y 5, se presentan los datos correspondientes a la cantidad de solicitudes aprobadas y volumen (m^3) aprovechado, según sean Agrosilvopastoriles (SAF) o Planes Operativos Anuales (POA), para el período 2015 al 2022.

Tabla 4. Solicitudes de Aprovechamiento y Volumen Extraído en SAF

Descripción	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Número de Solicitudes aprobadas	0	0	4	1	0	0	0	0	5
Volumen Extraído	0	0	30.84	16.48	0	0	0	0	47.32

Los registros indican un mínimo aprovechamiento en 2017 y 2018 en la modalidad denominada SAF y nulo aprovechamiento entre el 2019 y 2022.

Tabla 5. Solicitudes de aprovechamiento y Volumen Extraído en POA

Descripción	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Número de Solicitudes aprobadas	1	0	1	0	0	0	0	0	2
Volumen Extraído	169.953	0	210	0	0	0	0	0	379.953

En el caso de los POA que se derivan de Planes de Manejo, también la especie experimenta un aprovechamiento mínimo en 2015 y 2017 y nulo aprovechamiento desde el 2018 al 2022.

Otra modalidad de aprovechamiento son los Permisos Especiales que se otorgan de madera caída por fenómenos naturales o aquellos que ponen en riesgo la vida de las personas u otros.

Los datos que se muestran en la tabla 6, indican un mínimo aprovechamiento de la especie, excepto 2018 que tiene el 64.5% de todo el período, teniendo en los últimos 4 años un bajo aprovechamiento.

Tabla 6. Solicitudes de Aprovechamiento y Volumen Extraído de Permisos Especiales

Descripción	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de solicitudes aprobadas	2	0	3	9	8	1	3	4	30
Volumen extraído	29.291	0	15.146	375.919	87.374	20.825	3.094	51.312	582.961

Esta tabla 7 también muestra que Nicaragua está realizando un aprovechamiento mínimo de *Dalbergia Tucurensis* desde el 2015, teniendo como promedio anual 126.3 m³ de volumen aprobado.

Tabla 7. Cantidad de volumen en m^3 transportados en el período 2015 - 2022 para *Dalbergia tucurensis*

Volumen aprobado	**Volumen transportado**	**Volumen exportado**
2015 al 2022	**2015 - 2022**	**2015 al 2022**
1,010.2 m³	**3,587.7 m³**	**3,326.67 m³**

Los datos más elevados de volumen transportado y exportado son debido a productos remanentes de años anteriores (la durabilidad de la madera permite almacenarla por varios años) y/o de decomisos que fueron subastados y exportados también en años anteriores.

Amenazas para la especie (y cualquier medida adoptada para reducirlas)

Las amenazas para las especies en general son el cambio de uso del suelo, los incendios y el aprovechamiento ilegal.

En el caso de cambio de uso del suelo no se cuenta con registros puntuales que demuestren la afectación de poblaciones de *Dalbergia tucurensis*. De igual manera los incendios forestales, pero en este caso, el INAFOR y MARENA impulsan campañas para prevenir los incendios y sensibilizar a las familias nicaragüenses, realizando visitas casa a casa de noviembre a mayo de cada año (sólo INAFOR registró en la campaña 2021-2022 la visita a 25,113 familias), logrando reducir la superficie afectada de 26,140 ha en 2007/2008 a 6,000 ha en 2021/2022.

- **Control del Comercio Ilegal.**

El aprovechamiento ilegal se controla a través de puestos de control ubicados estratégicamente en todo el territorio nacional, además atención a denuncias que se reciben y con operativos que se realizan.

INAFOR cuenta con una red de 18 puestos de control estratégicamente ubicados que sirven para garantizar el traslado seguro de productos forestales e identificar el comercio ilegal.

Además, se cuenta con la Trazabilidad Forestal, que es un sistema desarrollado en una plataforma WEB, conocida como Code On Time, utilizando una base de datos implementada en SQL 2008, y constituye una herramienta muy importante para conocer los antecedentes de un producto de madera de cualquier sitio del país proveniente de un área autorizada por el ente regulador INAFOR.

A continuación, se presenta el resumen de decomisos de madera de *Dalbergia tucurensis* producto del corte y comercio ilegal, que por los datos se puede considerar muy bajo.

Tabla 8. Resumen de decomisos y volumen incautado de *D. tucurensis*.

Descripción/año	2015	2016	2017	2018	2019	2020	2021	2022	Total
Número de decomisos				1			1		2

Volumen decomisado (m³)				9.707 m³			3.625 m³		13.332 m³
Sitios del decomiso				Municipio de Chinandega, departamento de Chinandega			Municipio de Morrito, departamento Río San Juan		

Detalles sobre el uso de la especie; es decir, ¿se tala principalmente para obtener madera o hay otras partes y derivados importantes comercialmente? ¿Existe un mercado nacional además de internacional? ¿Hay datos sobre el volumen de comercio domestico?

El aprovechamiento de *Dalbergia tucurensis* es principalmente para el mercado de exportación, por su alto valor.

En el mercado nacional se limita su aprovechamiento por la dureza de su madera, sin embargo, se utiliza en el mercado interno en pequeñas cantidades y se puede ver en ferias locales y nacionales como muebles, mesas, artesanías, entre otras.

Figura 1 y 2. Muestras de artesanías, algunas de ellas de *Dalbergia tucurensis*

El volumen de permisos aprobados cada año se muestra en las tablas 4, 5 y 6, pero no se tiene registro de lo que será exportado y destinado al comercio nacional.

Regulación de la recolección silvestre y el comercio (por ejemplo, cuotas legales de recolección, cuotas de exportación, diámetros mínimos de corte, duración de la rotación, y planes de gestión), incluyendo detalles de las concesiones específicas en funcionamiento. Le agradeceríamos que nos faciliten copias.

El aprovechamiento forestal es regulado por el INAFOR, basado en la ley 462, su reglamento y las NTON.

Para asegurar el manejo forestal sostenible se aplica la norma técnica NTON 18 001-12 ***"Para el manejo sostenible de los bosques latifoliados y coníferas",*** aprobada el 19 de febrero del 2012 y publicada en La Gaceta No. 155 del 16 de agosto del 2013, define como Corta anual permisible (CAP): el volumen que se permite extraer en un período de tiempo (un año) constituido por el crecimiento del bosque y determinado por varios factores tales como el incremento corriente o medio anual, la estructura, el área y la edad de rotación.

Una herramienta que se aplica es la fórmula de Van Mantel, que tiene la ventaja de utilizar sólo una estimación del inventario del bosque actual y la rotación en el bosque normal.

En Nicaragua actualmente se utiliza la fórmula de Von Mantel mejorada, ya que incorpora la intensidad de corta como una medida del potencial de recuperación del bosque, denominada Volumen de Corta Anual Permisible (VCAP) en la cual se toma en cuenta los siguientes elementos:

$$VCAP = S_1 x V_1 + \ldots + S_n x V_n x \frac{IC}{T}$$

Donde VCAP=volumen de corta anual permisible (m^3/año)

S_n =superficie del estrato N

V_n = volumen por hectárea del estrato N

T = ciclo de corta

I_C =intensidad de corta

Fórmula Von Mantel mejorado y variables

El VCAP se establece anualmente para cada municipio utilizando como insumos la superficie de bosque productivo (actualmente 2020), el ciclo de corta, que en el caso de *Dalbergia tucurensis* es de 30 años, la intensidad de corta 40% del área basal y el volumen comercial existente que se determina de planes de manejo en ejecución en el municipio, datos derivados de las unidades de muestreo del Inventario Nacional Forestal y de las parcelas que se usan en los estudios poblacionales de especies forestales.

El diámetro mínimo de corta de 40 cm DAP garantiza que la regeneración ya establecida “reponga” los individuos de diámetros mayores aprovechados.

Detalle de permisos otorgados en los últimos 2 años

En la tabla 9 se muestran los permisos otorgados para el aprovechamiento de *Dalbergia tucurensis*, en la modalidad de Sistemas Agroforestales, en el año 2021 fueron aprobados dos permisos para aprovechar 3 árboles, y en el 2022, 4 permisos para extraer 46 árboles.

Tabla 9. Detalle de los permisos aprobados en la modalidad SAF

Año	**Departamento**	**Municipios**	**Comarca**	**Total árboles**	**CoorX**	**CoorY**
2021	Matagalpa	Río Blanco	La Ponzoña	1	691376	1429696
2022	Matagalpa	Rancho Grande	Las Brisas	29	666125	1467204
2021	RACCN	Waspam	Santa Clara	2	805313	1599049
2021	León	Larreynaga	Mina El Limón	1	529914	1410830
2022	León	Larreynaga	Mina El Limón	9	529066	1411500
2022	León	Larreynaga	Mina El Limón	5	529337	1411495
2022	Madriz	San Juan Río Coco	Las Cañas	11	595398	1502871

Información sobre el tamaño y la estructura de la población en los lugares de explotación (incluyendo si se han realizado inventarios o seguimientos de la especie y, en caso afirmativo, detalles completos, por ejemplo: concesión/plantación, área, número de individuos inventariados, estructura de la población, incluyendo el número de individuos en cada clase de diámetro). Si no se han realizado inventarios, ¿hay planes para hacerlo?

En el sistema de trazabilidad que maneja INAFOR registra diversas variables de los permisos de aprovechamiento forestal en sus diversas modalidades, entre ellas número de expediente, solicitante, departamento, municipio, volumen aprobado, ver tabla 10.

Tabla 10. Detalle de los permisos de aprovechamiento de *Dalbergia tucurensis* aprobados entre 2015 al 2022.

N° Permiso	Serie	Fecha	Distrito	Municipio	N°Expediente	Propietario	Objetivos	Total Arboles	Volumen
11330	J	13/7/2015	Departamento Madriz	Telpaneca	0907PE15001	JULIO CÉSAR FLORIAN QUINTERO	Árboles afectados	2	14.773
11522	J	27/10/2015	Departamento Puerto Cabezas Y Waspam	Puerto Cabezas	1603PGMFLI0150011601	BLOQUE SIPBAA/Oscar Rolando Sariles Rodríguez, Tat	POA	91	169.953
11646	J	22/12/2015	Departamento Madriz	San Juan del Río Coco	0904PE15004	Milena Hernández Gómez	POA	5	14.518
12147	J	4/8/2017	Departamento Río San Juan	Morrito	1403-ASP-017-003	PORFIRIO SIRIAS SOTO	árboles afectados	9	14.693
12273	J	13/10/2017	Departamento Madriz	San Juan del Río Coco	0904-ASP-17-001	APOLONIO HUMBERTO MELGARA BARRERA	árboles afectados	2	6.233
12286	J	19/10/2017	Departamento Matagalpa	Matagalpa	1203-PE-17-004	ENATREL/SALVADOR MANSELL CASTRILLO	POA	1	3.484
12289	J	19/10/2017	Departamento Madriz	San Juan del Río Coco	0904-ASP-17-002	JEYMI MARÍA MELGARA LOPEZ	SAF	1	3.88

12323	J	9/11/2017	Departamento Madriz	San Juan del Rio Coco	0904-ASP-17-003	PAULA DE JESÚS GUTIERREZ HERNÁNDEZ	SAF	6	6.03
12348	J	22/11/2017	Departamento Madriz	San Juan del Río Coco	0904PE17002	DENIS ALBERTO MORENO	POA	12	11.099
12400	J	15/12/2017	Departamento RACCS	La Cruz de Río Grande	1703PGMFL17001-1701	JORGE LUIS SOLORZANO JIMENEZ	POA	202	210
12430	J	21/12/2017	Departamento Jinotega	Santa María de Pantasma	0706-PE-17-011	ENATREL/ SALVADOR MANSELL CASTILLO	árboles afectados	1	0.563
12449	J	9/1/2018	Departamento Jinotega	San Sebastián de Yalí	0705-ASP-18-001	Amando Alberto Duarte Zeledón	árboles afectados	4	16.487
12522	J	27/2/2018	Departamento Las Minas Prinzapolka	Bonanza	1601-PE-18-001	HEMCO - NICARAGUA S,A	Permiso especial	37	9.01
12554	J	23/3/2018	Departamento Jinotega	San Sebastián de Yalí	0705-PE-18-003	PEDRO MEDINA CASTILLO	Permiso especial	10	16.17
12555	J	23/3/2018	Departamento Jinotega	San Sebastián de Yalí	0705-PE-18-004	FRANCISCO ANTONIO ARAÚZ REYES	árboles afectados	5	12.313
12587	J	13/4/2018	Departamento Río San Juan	El Castillo	1402-PE-18-002	ANDRES MEDINA LIRA	Permiso especial	1	2.519

12604	J	17/4/2018	Departamento Chontales	Juigalpa	0404-PE-18-006	ENACAL/FERNANDO JOSÉ FLORES AGUILAR	Permiso especial	1	0.097
12647	J	10/5/2018	Departamento Las Minas Prinzapolka	Bonanza	1601-PE-18-002	HEMCO DE NICARAGUA, S.A	POA	196	16.934
12650	J	14/5/2018	Departamento Matagalpa	El Tuma - La Dalia	1213-PE-18-002	Proyecto Hidroeléctrico San Martin /Empresa IHC S.	POA	310	289.247
12734	J	28/6/2018	Departamento Jinotega	San Sebastián de Yalí	0705-PE-18-012	ENATREL/SALVADOR MANSELL CASTRILLO	Permiso especial	1	0.319
12816	J	20/8/2018	Departamento Madriz	San Juan del Río Coco	0904-PE-18-002	JOSÉ ANTONIO TALAVERA RIVAS	Permiso especial	4	29.31
13146	J	2/4/2019	Departamento Madriz	San Juan del Río Coco	0904-PE-19-005	PEDRO ALEJANDRO RUIZ CENTENO	árboles afectados	4	11.84
13204	J	25/4/2019	Departamento Jinotega	San Sebastián de Yalí	0705-PE-19-003	HERMOGENES DE JESÚS RUGAMA LAGOS	árboles afectados	1	10.704
13204	J	25/4/2019	Departamento Jinotega	San Sebastián de Yalí	0705-PE-19-003	HERMOGENES DE JESÚS RUGAMA LAGOS	árboles afectados	1	3.273

13204	J	25/4/2019	Departamento Jinotega	San Sebastián de Yalí	0705-PE-19-003	HERMOGENES DE JESÚS RUGAMA LAGOS	árboles afectados	1	4.053
13204	J	25/4/2019	Departamento Jinotega	San Sebastián de Yalí	0705-PE-19-003	HERMOGENES DE JESUS RUGAMA LAGOS	árboles afectados	1	3.928
13245	J	17/5/2019	Departamento Jinotega	San Sebastián de Yalí	0705-PE-19-005	Santos Talavera Moreno	Permiso especial	1	13.316
13516	J	2/10/2019	Departamento Madriz	San Juan del Río Coco	0904-PE-19-009	PABLO RAUL HERNANDES VANEGAS	POA	12	39.41
13580	J	21/11/2019	Departamento Matagalpa	Río Blanco	1207-PE-19-001	MODULO COMUNITARIO DE ADOQUINADO No1	Permiso especial	1	0.85
13913	J	1/9/2020	Departamento Matagalpa	Rancho Grande	1206-PE-20-003	MINERALES NUEVA ESPERANZA S.A	POA	36	20.825
14146	J	26/2/2021	Departamento Matagalpa	Río Blanco	1207-PE-21-001	CONSTRUCTORA MECO S,A	Árboles afectados	1	0.204
14488	J	5/7/2021	Departamento Puerto Cabezas Y Waspam	Waspan	1607-PE-21-090	JOSÉ AJENOR PEREZ OMIER	Árboles afectados	2	2.31

14792	J	1/12/2021	Departamento Leon	Larreynaga	0811-PE-21-003	TRITON MINERA S.A / OMAR VEGA SEVILLA	Plan Especial	1	0.58
14840	J	5/1/2022	Departamento Leon	Larreynaga	0811-PE-22-001	TRITON MINERA S.A	Plan Especial	9	5
14894	J	15/2/2022	Departamento Leon	Larreynaga	0811-PE-22-002	TRITON MINERA S,A	POA	5	3.474
15156	J	9/9/2022	Departamento Matagalpa	Rancho Grande	1206-PE-22-006	DESARROLLO MINERO DE NICARAGUA S,A	POA	29	12.288
15201	J	26/10/2022	Departamento Madriz	San Juan del Río Coco	0904-PE-22-010	CAIRO ANTONIO SARAVIA DUARTE	Plan Especial	11	30.55

Cada solicitud de permiso incluye un inventario de la vegetación existente del sitio de interés, pero nos falta aún sistematizar los datos para poder presentar la distribución diamétrica de la población de interés de cada permiso.

Cada permiso que es otorgado conlleva seguimiento post aprovechamiento para verificar el cumplimiento de las normas y de lo aprobado para extraer, así como la debida reposición del recurso.

En el caso de las plantaciones se lleva un registro de 19 plantaciones establecidas entre el 2019 y 2022 con los detalles que se muestran en la tabla 11.

Tabla 11. **Detalle de las plantaciones establecidas de *Dalbergia tucurensis* de 2019 a 2022.**

No Expediente	Dueño	Fecha Registro	Nombre Plantación	Distrito	Municipio
0101171913	JENARO ANTONIO SOLANO GUTIÉRREZ	19/10/2021	SANTA GERTRUDIS	Boaco	Boaco
0102171869	MARCELINO GONZÁLEZ BORGE	22/9/2021	MARIA AUXILIADORA	Boaco	Camoapa
0102171878	DIONICIO BORGE GARCIA	1/10/2021	SAN JERONIMO	Boaco	Camoapa
0102171879	BRUMILDO GONZÁLEZ ESCORCIA	1/10/2021	EL CIELO	Boaco	Camoapa
0102171883	FELIX GONZÁLEZ BORGE	1/10/2021	SANTA RITA	Boaco	Camoapa
0703172324	SERGIO ALEJANDRO ESPINOZA HERRERA	3/8/2022	CEF SANTA LUCIA	Jinotega	Jinotega
0703182382	WARREN EDWARD ARMSTRONG	22/6/2022	SANTA ANA	Jinotega	Jinotega

No Expediente	Dueño	Fecha Registro	Nombre Plantación	Distrito	Municipio
0703182389	EDGAR FRANCISCO GUTIÉRREZ CHAVARRIA	15/7/2019	EL FALDON	Jinotega	Jinotega
0703182394	SILVIO JOSE GONZÁLEZ	16/7/2019	SAN MARTIN	Jinotega	Jinotega
0703182439	SORAYA DE LOS ANGELES ZEAS RIVAS	12/7/2019	LOS MILAGROS	Jinotega	Jinotega
0703182447	FRANCISCA LIGIA ALTAMIRANO	14/5/2021	EL RECUERDO	Jinotega	Jinotega
0703192508	JEAN YVES DURIAUX CHAVARRIA Y LILIANA RENATA CHAV	15/4/2021	LA GARZA	Jinotega	Jinotega
0703202691	MARÍA NIEVES VARGAS	3/3/2021	EL GRANADILLO	Jinotega	Jinotega
0706182341	ENRIQUE DEL CARMEN MARTINEZ	16/7/2019	LA CONCEPCION	Jinotega	Santa María de Pantasma
0706212785	JORDIN CASIMIRO RIVERA MAIRENA	29/11/2021	LINDA VISTA	Jinotega	Santa María de Pantasma
1701172067	SEBASTIAN CHANG SANCHEZ	30/11/2021	LOS PINITOS	RACCS	Bluefields

No Expediente	Dueño	Fecha Registro	Nombre Plantación	Distrito	Municipio
1701172068	BETTY CAROLINA ORTIZ JIRON	9/12/2021	SANTA ISABEL	RACCS	Bluefields
1707171488	CRISTOBAL JOSE SANCHEZ QUIROZ	20/7/2021	EL SOCORRO	RACCS_Zelaya Central	Muelle de los Bueyes
1707222831	TOMÁS MANUEL SEQUEIRA OBANDO	15/3/2022	LAS BRISAS	RACCS_Zelaya Central	Muelle de los Bueyes
1708172025	MARJORIE NINNET CARRANZA LAZO	1/2/2022	EL ZAPOTE	RACCS_Zelaya Central	Nueva Guinea

Detalles sobre cómo se elaboran los dictámenes de extracción no perjudicial, incluidas las instituciones que participan en el proceso

Explicación de cómo la Autoridad Científica (INAFOR) formula un Dictamen de Extracción No Perjudicial (DENP)

El DENP se realiza únicamente en las áreas autorizadas que cuenten con un Permiso de Aprovechamiento Forestal Vigente aprobado y emitido por INAFOR, teniendo como condición previa la aprobación de un Plan de Manejo Forestal, cuya presentación y ejecución está bajo la responsabilidad de los propietarios o de quien ejerza los derechos sobre el mismo. La forma, requisitos y procedimientos para la aprobación de un plan de manejo forestal y la emisión de un permiso de aprovechamiento, son determinadas por el Reglamento de la Ley N° 462: **LEY DE CONSERVACIÓN, FOMENTO Y DESARROLLO SOSTENIBLE DEL SECTOR FORESTAL** (Artículo 21).

Así mismo, el INAFOR desde el año 2012 utiliza el Volumen de Corta Anual Permisible (VCAP), para asignar cuotas de aprovechamiento sostenibles anuales del bosque latifoliado, coníferas y específicamente de la especie *Dalbergia tucurensis*, garantizando que el bosque y las especies no alteren su dinámica y distribución ecológica poblacional, en este sentido el INAFOR está dividido administrativamente en 15 delegaciones departamentales y 4 sub regionales.

Las variables utilizadas para obtener el VCAP se detallan a continuación:

- Cobertura forestal por tipo de bosque y municipio.
- Volumen total, comercial por municipio.
- Especies autorizadas por municipio.
- Intensidad de corta.
- Ciclo de corta por tipo, bosque o especie.

El volumen anual de corta permisible por año que autoriza el INAFOR se fundamenta, como se mencionó antes, en la Norma Técnica Obligatoria Nicaragüense para el Manejo Sostenible de los Bosques Naturales Latifoliados y de Coníferas, número NTON 18 001 – 12, así como la resolución administrativa No. 11-2015 que establece las Disposiciones Administrativas para el Manejo Sostenible de los Bosques Latifoliados, Coníferas y Sistemas Agroforestales.

Instituciones que participan en la formulación de dictamen de extracción no perjudicial.

De conformidad a la Política Administrativa para el Uso y Aprovechamiento de los Recursos Naturales y Manejo Forestal, publicada en la Gaceta número 141 del 30 de julio del 2012, las instituciones que participan en el proceso de formulación de Dictamen Técnico de Extracción No Perjudicial:

- Instituto Nacional Forestal (INAFOR) como ente regulador.
- Ministerio del Ambiente y de los Recursos Naturales (MARENA)
- Gobiernos Municipales, ya que es en sus territorios donde geográfica y físicamente se desarrolla la especie.
- Gobiernos Regionales Autónomos del Caribe Sur y Norte, cuando sea el caso.

En el proceso de aprobación, seguimiento y monitoreo participan:

- Ministerio del Ambiente y de los Recursos Naturales (MARENA).
- Instituto Nacional Forestal (INAFOR).
- Alcaldías Municipales, como administradores de sus territorios.
- Gobiernos Regionales (según sea el caso).
- Policía Nacional, en cumplimiento a la normativa de la Contraloría General de la República acerca de los permisos de aprovechamiento de los recursos naturales.
- Ejército de Nicaragua. En cumplimiento a la normativa de la Contraloría General de la República acerca de los permisos de aprovechamiento de los

recursos naturales.

El INAFOR con la participación de representantes de las autoridades municipales y gobiernos regionales, en su caso, aprueba o deniega, previa audiencia pública, los Planes de Manejo Forestales en un plazo no mayor de 30 días hábiles. La audiencia pública es convocada por el INAFOR y en ella participan las y los técnicos forestales de las alcaldías municipales y gobiernos regionales autónomos que correspondan. La audiencia pública toma como referencia obligatoria la norma técnica aprobada según el tipo de bosque o el área bajo manejo.

Vencido este plazo el Plan de Manejo se da por aprobado y el solicitante podrá ejecutarlo. En este caso el INAFOR procede a registrar y emitir el permiso correspondiente de forma inmediata. (Artículo 22 Ley No. 462 Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal).

Datos de contacto de cualquier experto pertinente en el país

Por INAFOR

Luis Alberto Valerio Hernández, correo dmif.lvalerio@inafor.gob.ni

Por MARENA

René Castellón, correo rcastellon@marena.gob.ni

Anexos

Informe de *Dalbergia tucurensis* remitido CITES

Ley No. 462 Ley de Conservación, Fomento y Desarrollo Sostenible del Sector Forestal

NTON 18 001 – 12

Resolución administrativa No. 11-2015

CONSERVATION AND ENVIRONMENT PROTECTION AUTHORITY
OFFICE OF THE MANAGING DIRECTOR

7th Floor-Dynasty Tower II
Savannah Heights, Waigani
P O Box 6601
BOROKO, NCD
Papua New Guinea

Telephone: (675)3014500/3014530
Facsimile: (675)3250182
E-mail: officesec@dec.gov.pg
Website: www.dec.gov.pg

Date: 28th Nov 2023
File No: CITESNDF01-20
a/officer: ngowep

To: **UN Environment World Conservation Monitoring Centre**
219 Huntingdon Road, Cambridge CB3 ODL,
UNITED KINGDOM

Dear Colleagues,

Subject: **Review of Significant Trade in Specimens of Appendix II species [Resolution Conf. 12.8 (Rev. CoP18)]**

In the context of the letter received dated 6th November 2023 on the matter relating to the Review of Significant Trade in species of appendix II pertaining to the Gryphosis species, please find the following from Papua New Guinea, CITES Management Authority.

In response to the questions raised as part of the Review of Significant Trade in Specimens of Appendix II Species [Resolution Conf. 12.8 (Rev.CoP18)], the PNG CITES Management Authority's response to the questions are as follows;

Q1. Three of the Gyrinops spp that are found in PNG are;

- *Aquilaria filarial*, *Gyrinops ledermanii* and *Gyrinops caudata*. These species are naturally grown and found in certain provinces namely; East and West Sepik, Madang, Central, Western, Gulf and Morobe and also in some parts of the high altitudes of Enga Province.

Q2. Not available

Q3. The major threat to the genus is the illegal harvesting and mismanagement by the locals due to lack of information and knowledge. To address this issue the Government in March 2011 released a management plan for natural eaglewood resources in PNG to be implemented by Papua New Guinea Forest Authority (PNGFA).

Q4. The genus is grown and harvested mainly for agar. There is currently a domestic as well as international market where the genus is trading mainly for its aromatic oil. Unfortunately, there is no data available on how much volume is being harvested domestically.

Q5. There are regulations and guidelines in place that govern the growing of the genus. The genus is grown, maintained and harvested under the regulations of whichever forest area the genus is found to grow in such as a Forest Management Authority (FMA), Timber Authority (TA), Forest Clearing Authority (FCA) and Local Forest Authority (LFA). For instance, if any of the 3 species is found growing within an FMA area, then all the policies and regulation applicable to manage this FMA will be used to regulate the genus' planting and harvesting activities.

Q6. Refer to the Management plan for Eagle wood

Q7. The contact detail from the Papua New Guinea Forest Research institute is Mr. **Goodwill Amos**, The Director, PNG Forest Research Institute, P O Box 314, Lae 114, Morobe Province, PNG,

Email: gamos@fri.pngfa.gov.pg/goodwillamos5@gmail.com,

Phone: (+675) 73149368

If you need additional information, please do contact **Mr. Nicho Gowep**, Acting Manager, Wildlife Trade and Enforcement Branch through his email address; ngowep16@gmail.com or via Phone: (+675) 3014500/3014549

Yours sincerely

Jude TUKULIYA
Acting Managing Director

Attachments

1. Management Plan for Eagle Wood

MANAGEMENT PLAN FOR NATURAL EAGLEWOOD RESOURCES

IN

PAPUA NEW GUINEA

PAPUA NEW GUINEA FOREST AUTHORITY

March, 2011

Content

Abbreviations

CITES	= Convention on International Trade of Endangered Species (Fauna and Flora)
DEC	= Department of Environment and Conservation
FCA	= Forest Clearance Authority
FIP	= Forest Industry Participant
FMA	= Forest Management Agreement/Area
ILG	= Incorporated Landowner Group
LFA	= Local Forest Area
PNG	= Papua New Guinea
PNGFA	= Papua New Guinea Forest Authority
PNGFRI	= Papua New Guinea Forest Research Institute

Overview

The objective of this management plan is to sustain and maintain viable populations of eaglewood in natural forest areas in PNG where agar wood or eaglewood resource is being harvested and exported. This plan is provided to assist communities, buyers, exporters and Papua New Guinea Forest Authority (PNGFA) to monitor their harvesting practices, sustain the resource base and maximize the returns from sale of eaglewood products.

The eaglewood resource in Papua New Guinea is found both in lowland forests in seven provinces in Papua New Guinea (West and East Sepik, Madang, Central, Western, Gulf and Morobe) and in some high altitude forests (Wabag, Enga Province) (Figure 1). Its distribution is restricted to limited forests types and in stock densities as affected by soil type and local climatic conditions.

The plan will enhance the sustainable harvesting of eaglewood resource, maintain genetic diversity within eaglewood populations and conservation of the species through community participation in sustainably managing their resources.

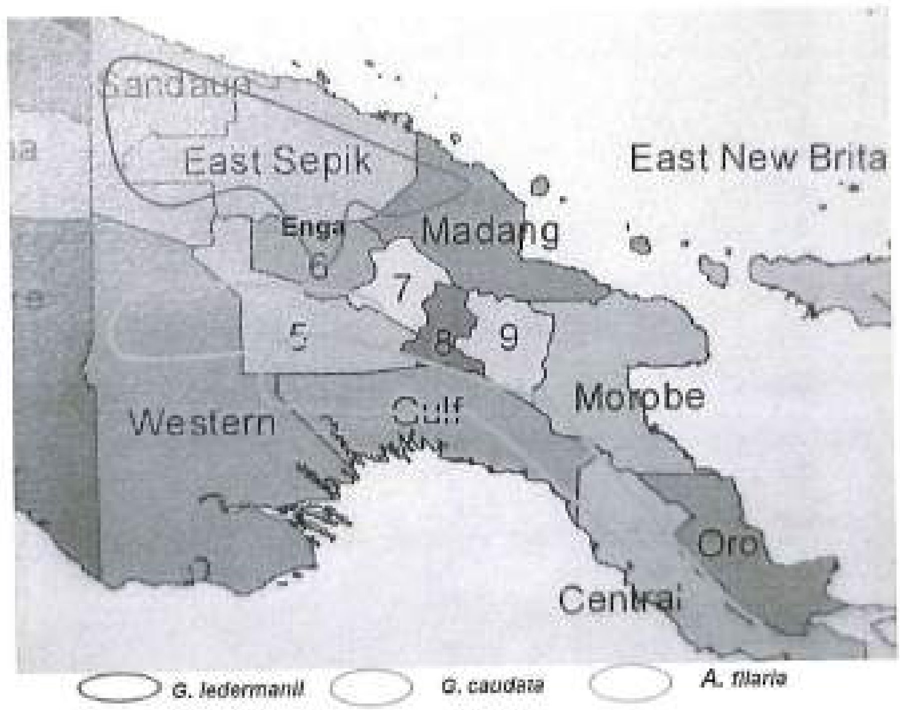
The species covered in this plan are: *Aquilaria filaria* (Oken) Merr., *Gyrinops ledermanii* Domke and *Gyrinops caudata* Domke. These species are listed under CITES (Appendix II). PNG is a signatory to CITES and therefore has an obligation to implement the requirements for biological species listed in its appendices to protect, utilize and sustainably manage it.

Additional information gathered through research, field extension, training and regular monitoring and awareness will provide the basis for improving the management strategies and harvesting practices of eaglewood in PNG.

PNGFA will implement the plan and coordinate activities undertaken by stakeholders to ensure that the management and harvesting practices are in compliance with the plan. Data gathered from eaglewood management areas will be provided to PNGFA for analysis, reviewing and reporting.

This Management Plan is divided into three Parts: **Part A** addresses the Management Objectives; **Part B** covers the Guidelines on how to implement this plan; and **Part C** provides the specifics on the Management Procedures and activities that the harvesters, monitoring officers and exporters needs to implement in the field.

Figure 1: Map Showing Eaglewood Producing Sites in Papua New Guinea



Part A: Management Objectives

1 Objectives

The objectives of this Management Plan is to provide a management tool to regulate the harvesting of eaglewood resource in Papua New Guinea and to monitor the trade of eaglewood products exported to markets overseas.

This plan provides the protocols and procedures to document and evaluate standing stocks of eaglewood to meet the present and future demands and needs of the local communities.

The protocols and procedures require all stakeholders to gather data and provide reports to PNGFA for management, verification and reporting (MRV) to Management Authority as required by the Convention on International Trade of Endangered Species (CITES).

The plan requires further research to be carried out on the distribution, ecology, botany, silviculture, harvesting and marketing of eaglewood for the development of woodlots and plantations. These requirements are to be undertaken as part of the continued awareness and training of eaglewood farmers in the communities.

2 Legal Frame Work

The management and monitoring of eaglewood in Papua New Guinea is catered for under the Forestry Act, the Forest Policy under the forest industry strategies section 5, and Part IV, forest research policies (b)(iv)(v), and under forest research strategies (2)(iv) cultivating, management and utilization of minor forest products with objectives of increasing income of the rural population and other Forest Development Guidelines. In the Forest Policy, it is considered as a small industry, along with rattan, sandalwood, mushrooms, waria waria oil and other small-scale downstream processing (or cottage) industries.

All participants (buyers and exporters) in the eaglewood trade are required to register as Forest Industry Participants (FIP) as required under section 107 of the Forestry Act 1991 (as amended) and be issued a harvesting authority for commercial utilization of minor forest products.

It is therefore a legal requirement for buyers and exporter to obtain a license to buy, sell, transport, harvest and export of eaglewood products

The harvesting of eaglewood from local forest resource areas will be managed within the current management practices of PNGFA and as part of the monitoring activities.

In forest areas covered under conservation management strategies (Wildlife Management Areas, Conservation Areas, National Parks), extraction of eaglewood products will be subjected to management rules for each respective area.

PNGFA as the regulating agency will ensure that appropriate information and data are maintained to manage and monitor harvesting of eaglewood populations.

3 Inventory

A national inventory of eaglewood is essential to determine the current stocks, stand densities of existing stocks and the percentage of affected trees within the population that show evidence of agar in areas where they are found. Such inventories will be conducted through the following processes:

- Periodic Resource Inventories undertaken by PNGFA for proposed forest development areas;
- Specific inventories undertaken for the purpose of determining the stocks of standing trees, eaglewood development on trees and growth performance based on reported sightings;
- 100% pre-harvesting inventory within FMAs, LFAs and FCAs undertaken by developers, such that eaglewood trees are identified and included for protection within the Forest Working Plan or in the case of FCA, excluded from clear felling
- Surveys undertaken for research and management purposes within conservation areas and managed by DEC and non-government agencies; and
- Surveys undertaken by resource owners within their demarcated forest resource areas.

4 Harvesting

Landowners are required to undertake inventory of their resource areas and have an approved Harvesting Plan to harvesting their trees. Eaglewood trees must be marked and indicated on a Map 1:100,000 and zoomed to an appropriate scale with identifiable topographical features.

Trees with potential agar must be marked during the inventory or when identified at a later date at least 6 months prior to harvesting and noted in the harvesting plan.

5 Marketing

Exporters and traders of eaglewood products must be registered FIP as required under Section 107 of the Forestry Act 1991 (as amended). An exporter must be recognized by PNGFA as certified grader or must engaged a certified graders to grade and value agar wood traded by the communities.

PNGFA will issue ***Packaging and Storage Labels*** to harvesters and traders base on their license and FIP numbers. These must eaglewood products when trading and exporting.

Application for a permit to export eaglewood products by a buyer must be accompanied by the ***Export data***, *the* ***Packaging and Storage label*** and the ***Buyers Data Sheet*** for evaluation and approval. PNGFA will verify the stocks and value of eaglewood bound for export prior to endorsing an export permit.

PNGFA will review and adjust the buying price for eaglewood products as and when required, acknowledging the variation in price between overseas and local buyers.

6 Sustaining Natural Stands

Natural stands of eaglewood must be harvested in a sustainable manner by the landowners for their long term benefit.

Eaglewood stands will be inventoried, mapped and a Harvesting Plan provided for each resource area as a pre-requisite to harvest and trade the product.

Landowners within the resource areas will be trained on how to manage and sustainably harvest their eaglewood and how to do enrichment planting and reforestation in the field.

Local Eaglewood Committees (LEC) within resource owning communities or other accepted monitoring protocols will be established to monitor and enforce good harvesting practices.

7 Monitoring

PNGFA will monitor harvesting of eaglewood within Timber Authority (TA) sites, Forest Management Areas (FMA), Local Forest Areas (LFA) and Forest Clearing Authority (FCA) projects.

Other resource sites outside these forest management areas will be managed through the local eaglewood management committees.

8 Compliance

Monitoring officers will assess and deal with non-compliance issues in the field as stipulated in the management plan. Major non-compliance to management practices will be referred to the management for further investigation and where required, penalized with a suspension.

A resource area under suspension will not be allowed to harvest and trade eaglewood products. Exporters will be notified of the suspension notice and directed not to accept products originating from these areas until the conditions of the suspension are addressed and the suspension is lifted. Exporters found not enforcing the order will be penalized.

9 Reports, Returns and Records

The operators (traders, buyers/exporter) must provide an annual report to PNGFA for all sales of produce for each year and must include the following details : a) buyer of the produce, b) total value of the produce sold, total weight of the produce sold, species and grades.

Project officers monitoring forests areas where eaglewood are harvested are required to submit annual reports to PNGFA/FRI or as and when required.

Monthly export data received by PNGFA will be verified against annual reports received.

PNGFRI as the Scientific Authority and the Department of Environment and Conservation as the Management Authority of CITES issues will meet and discuss the management issues relating to sustainable harvesting of eaglewood in Papua New Guinea every three years or as and when determined by both parties.

10 Review, Terms and Extension

The management plan will be reviewed every three years to determine compliance to field inventory, harvesting procedures, reporting and exporting.

Part B: Guidelines for Implementation

11 Inventory

11.1 Operators and resource owners to conduct inventory

11.2 Inventories will either be transects or circular plots depending on the population density and site.

11.3 All eaglewood trees greater than 10 cm dbh will be tagged with a number and measurements taken on their dbh, height and crown diameter.

11.4 The following information are to be recorded for each tree: flowering or seeding, symptoms of infections and density of seedlings on the forest floor.

11.5 Growth performance of residuals below 10 cm dbh, associated tree species and presence of insects within the area must also be assessed.

11.6 Use the tag numbers to monitor potential agar producing trees.

11.7 Eaglewood trees recorded in FMAs, LFAs, FCAs and TAs prior to logging of setups must be re-assessed to determine if they have been impacted during harvesting.

11.8 Copies of data from inventory surveys containing eaglewood stands must be forwarded to the PNGFA/FRI for data-basing, management, record purposes and for verification purposes.

12 Harvesting

12.1 Prior to harvesting an infected tree, measurements must be taken to reconfirm previous measurements on the dbh, height, health status and infected part of the tree. Harvesting of agar wood must be from marked

12.2 Extract infected parts of a tree that are visible.

12.3 Label the agar wood extracted with the same tag number on the package.

12.4 Wood chips of agar are to be carefully dried.

12.5 Trees already harvested are to be marked with yellow rings or painted, and monitored for further agar development.

13 Managing Natural Stands

13.1 Each resource area must be clearly defined with visible boundaries in the field.

13.2 Seed trees must be clearly marked in the field.

14 Selection and Monitoring of Wildings

14.1 Monitor seed trees for their flowering and fruiting times.

14.2 Collect seedlings from underneath seed trees, and then further raise them in the nursery.

14.3 Transplant the seedlings after 8 - 10 months in the nursery.

15 Nursery

15.1 Eaglewood resource owners must build nurseries to raise seedlings for enrichment planting.

15.2 Refer to the Manual on Nursery Techniques for raising wildlings and seedlings of Eaglewood (PNGFRI, 2009, unpubl.).

16 Enrichment planting

16.1 Enrichment planting shall be carried out in areas between standing agar trees and the gaps at 3 x 3 m or 5 x 5 m spacing.

16.2 Regular tending and vine cutting must be carried out in areas with enrichment plantings during the first 3 three years.

16.3 Indicate areas with enrichment plantings on the map.

17 Storage and Transportation

17.1 Agar wood harvested should be dried and kept in dry condition.

17.2 Ensure agar wood products are properly packaged prior to transporting to the market.

18 Marketing

18.1 The PNG Forest Authority will set the standards and procedures for grading of eaglewood products in PNG. These standards and procedures will be subject to approval of the National Forest Board and National Standards Council of PNG.

18.2 Grading is to be carried out by licensed exporters who are recognized as certified graders. Graders must record data on to the *Buyer Data Sheet*.

18.3 Agar wood is to be graded into the following categories (grades);

- Super A grade
- A grade
- B grade
- C grade

18.4 Standard prices for eaglewood products will be issued by the Minister for Forest as required under Section 121 of the Forestry Act 1991. The following price list can serve as a guide:

A. Super A grade	K 2,000/kg
B. A grade	K 1,500/kg
C. B grade	K 1,000/kg
D. C grade	K 500/kg
E. D grade	K 50/kg
F. E grade	K 10/kg

18.5 As a general guide, during the time of selling and buying:

- Wood shall be purchased according to weight and then their grade;
- To weigh products, buyers must use a scale that can weigh with an accuracy of 10 grams;
- Sellers may purchase their own scale to confirm weights;
- Keep same grades together when selling.

18.6 PNGFA will verify all volumes of eaglewood bound for export prior to issuing an export permit.

18.7 All export data must be reported to PNGFA Projects Allocation Directorate with the export application.

19 Compliance Requirements

19.1 Resource areas will be monitored to verify availability of eaglewood stock in the field and compliance to harvesting practices. Assessment will cover: harvesting methods; number of trees harvested, waste; management of nurseries; enrichment planting practices and maintenance of enrichment plantings.

19.2 Verification of sustainable management practices will be based on: evidence of good harvesting and extraction

19.3 Assessing non-sustainable practices will focused on these parameters: harvesting unmarked trees; no evidence of enrichment planting and number of non agar trees cut and left to waste.

19.4 Minor non-compliances will be addressed in the field by the monitoring officers through awareness and training. Minor non-compliances include: harvesting agar from seed trees, enrichment planting less than the number of trees harvested in a given year, and lack of maintenance of enrichment plantings.

19.5 Major non-compliances include: harvesting wood from unmarked trees, high wastage, removal of 50% of seed trees, no nursery, no enrichment planting, and reduction of standing agar trees to less than 50% of the original stock

19.6 Major non-compliances will be referred to PNGFA management to deliberate on and consider suspension of harvesting of eaglewood from the resource area as required under the PNGFA Forestry Regulation.

19.7 A resource area under suspension will not be allowed to harvest and trade eaglewood products. Exporters will be notified of the suspension notice. Exporters found not adhering to the lawful order will be penalized

Part C: Management Procedures

20 Application and Approval

The Resource Owners must apply to the Managing Director of PNG Forest Authority through Provincial Forestry Office expressing their interest to harvest eaglewood in their area. The application must include the following documents:

- Letter expressing their interest to harvest their eaglewood resource,
- Project document indicating the proposed project area, management and harvesting plan.

PNGFA will process the application and carry out a survey to verify the boundary of the area and volume of the resource.

21 Demarcating Eaglewood Resource Areas

- Eaglewood resource areas must be clearly defined and demarcated on the ground for sustainable management of stocks within each area. Demarcation of resource areas will be based on ILG land boundaries and user rights.
- Confirm ownership and user rights with community and Confirm landowning group with local land mediators,
- Survey boundary with support from local landowners, to ensure boundary follows the prescribed land marks.
- Place flagging tape markers every 50 meters.
- Take GPS positions taken along the boundary if possible.
- Transfer boundary readings to a map.
- Reconfirm boundary with the local community.

- Provide a narrative description of the demarcated area and attach to the base map.
- Have clan leaders (ILG Chairman) sign off on the map.
- Create a separate working base map, plotting all other verifiable features (ridges, rivers, creeks, settlements, gardening sites, sacred sites, etc.).
- Show areas containing stands of eaglewood on the map and identify each stand by name or number, where appropriate.

22 Inventory and Verification Method

- Conduct 100% inventory within the proposed area.
- Use line transects or circular plot methods to survey the resource area.
- Verify measurement and numbering of trees 10 cm dbh and above.
- Measure and number all trees with 10 cm dbh and above; numbering must be systematic.
- Record measurements on dbh, height, and crown diameter.
- Make observations on health status, flowering, fruiting, residuals, and regeneration.

23 Debriefing with Community/Landowners

The Inventory Team will conduct debriefing meeting with the community after the survey and update them on the following:

- Population or stock density of eaglewood surveyed within the demarcated area
- Locations of infected and non-infected trees
- Areas within the project that requires enrichment plantings
- Locations of seed trees
- Management strategy needed to sustain the resource
- Recommended harvesting method

All participants and resolutions agreed to during the meeting will be recorded.

PNGFA will evaluate the inventory data and approve or not approve the request

24 Format for Harvesting Plans

A Harvesting Plan must include the following information/ documents, and in this order:

1. Title of the resource area
2. ILG composition
3. LLG/district/province
4. Membership of Local eaglewood management and monitoring committee
5. Resource area
    - Land boundaries description
    - Topographical description of the area
    - Evaluation of eaglewood resource within the area
6. Harvesting Plan and Procedures
7. Maps (scale: 1:20:000) showing location of trees infected and are potential agar wood trees, seed trees and areas proposed for enrichment plantings
8. Inventory data of eaglewood from the Resource Area

25 Harvesting Eaglewood

1. Identifying and Selecting Potential Eaglewood Trees
    - Confirm that the potential tree has dark green leaves and it has started dying. Keep an eye out for other dead trees either standing or fallen.
    - Look for potential bumps and swollen nodes which may indicate internal formation of agar.
    - Select and mark potential trees and monitor swellings.
    - Monitor the stumps for the formation of agar.

2. Harvesting Agar from Marked Trees
    - Use the checking technique to confirm before harvesting the tree.
    - Harvest only infected tissue, ensuring that limited

- Use the harvesting tools (bush knives & axes) to check for the agar formation before chopping the infected area or part of the tree.
- Record the tag number of the tree and the part of the tree being harvested.

3. Harvesting Agar from Unmarked trees
    - If a tree is found outside the stock area, it must be included with the nearest stock and given the next register number on record.

4. Harvesting Agar from Stems
    - If there are signs of black liquid flowing out of the stem, check to see if there are agar formation before harvesting.
    - To chop the tree or part of the tree you must be sure of the density and the extension of agar formation.
    - When harvesting from the lying and fallen dried trees always use the checking technique.

5. Harvesting agar from branches
    - Harvest agar from infected or diseased branches only
    - Use the checking technique before harvesting the branches that show signs of agar formation.

6. Harvesting agar from Roots.
    - Harvest roots from fallen trees, if the formation of agar continues from the stem to the roots.
    - Formation of agar on chopped trees may take 6 months to some years therefore harvest only if there is a trace of agar formation.
    - Roots of dead trees buried underground may have agar and it can be harvested.

7. High Quality Agar Wood.
    - The quality agar wood is harvested from the joints in the trees, heavily infected stems or roots.
    - High quality agar woods are those dark brown or much darker color wood with high quality smelling in the wood.
    - Harvest according to the natural formation of agar on the wood. Do not chop the wood into smaller shapes and sizes.

8. Low Quality Agar Wood
   - Check to make sure that there is a uniform formation of a particular colour, mainly, black brown mixed as dark brown and harvest accordingly
   - To harvest low quality, use the same harvesting technique and differentiate base on uniformities of colours, density, shapes and the content of agar.

26 Enrichment Planting in Resource Areas

1. Selection of seed trees
   - Select 5-10 individuals with good bole and crown growth for each site.
   - Mark these trees to differentiate from other trees.

2. Phenology
   - Observe the seed trees for flower buds every month and take note of bud initiation, flower development, seed development and maturing time.
   - Once seeds have fallen, do regular visits to the tree and check for seedlings on the forest floor.

3. Seedling collection
   - Select healthy seedlings with no damage to the shoots.
   - Collect the seedlings and transfer them to pots.

4. Nursery
   - Continue to grow the seedlings under shade conditions.
   - Water in morning and afternoons only.
   - Provide enough space between the seedlings to avoid crowding and competition.

5. Selecting Planting Site
   - Select sites for enrichment planting within the stock area or along its edges and forest gaps.
   - Put in pickets at 3 m spacing to mark spots for planting.
   - Avoid waterlogged or frequently flooded sites.

6. Transplanting
   - After 6 months, transplant seedlings in the field.
   - Dig hole, remove the pot and carefully place seedling in the hole, and cover with top soil.

7. Tending and maintenance
   - Enrichment plantings should be tended monthly or regularly.
   - Remove vines and other suppressive weeds.
   - Create adequate light favorable to seedling growth if the forest floor is deemed too shady.
   - Dead seedlings should be replaced with new seedlings.

8. Re-measurement and gap plantings
   - Baseline measurement for growth performance (HT) should be taken after 12 months.

27 Management Activities

1. Field Inspections
   - A schedule for field inspection to Eaglewood Management Areas is required to ensure regular monitoring is done.
2. Training to be provided for;
   - Eaglewood Inventory and Mapping
   - Harvesting and Processing
   - Nursery Techniques and Enrichment Planting
   - Eaglewood Grading
3. Documentation
   - Review Eaglewood Management Plan
   - Review Harvesting Plan for Resources Areas
4. Meeting
   - Management and Scientific Authority Meeting

28 Types of Documents required by the Management Plan

Document Type	Who to Provide	When
1. Harvesting Plan for eaglewood resource area	Resource Owners	Initial
2. Inventory data (maps) from local eaglewood resource area	Resource Owners	Initial
3. Export data & buyer's data sheet obtained from exporters	Exporters	Application for Export permit
4. Packaging labels data from traders/harvesters; to be provided to buyers during trading	Resource Traders	Sales of Agar wood
5. Updated map of resource area and enrichment planting sites	Resource Owners	Annually

29 Inventory Data Sheet for Resource Areas

Inventory Data Sheet

	Resource Area		
Date		Population Stock	

Tree Numb	Species	DBH	HT	Crw Dia	flwr/frt/	Health Status

Observations:

Observations notes: *infection of trees, density of seedlings on the forest floor, growth performance of seedlings <10 cm dbh, associated trees and insects, geology, soil, drainage and topography. Crw Dia =Crown Diameter. flwr=flowering, frt=fruiting.*

23

30 Buyer's Data Sheet

PAPUA NEW GUINEA FOREST AUTHORITY			
EAGLEWOOD PURCHASING INVOICE RECORD			
			PNGFA INV#: 0000
BUYER/ EXPORTER		DATE	
PROVINCE		WARD	
DISTRICT		VILLAGE	
LOCAL LEVEL GOVT			

EAGLEWOOD STAND #		PART OF TREE HARVESTED *(RTS/ STM/ BRCH)*	
TREE #			

GRADE	RATE	VOLUME	AMOUNT (K)
S/A			
A			
B			
C			
D			
E			
AB			
BC			
CD			
D+			
TOTAL			

NOTE ON APPOINTMENT OF RANGERS

Appointment of rangers

Enforcement of the Crocodile Trade Protection Act is the responsibility of rangers appointed under the Fauna (Protection and Control) Act.

Section 20 of the Fauna Act provides that the Conservator may, by notice in the National Gazette, appoint a person to be a Ranger for the purposes of the Act.

A draft notice of appointment is attached. It should be submitted to the Legislative Counsel for preparation prior to sending to the Government Printer for publication in the Gazette.

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IN ANY CORRESPONDENCE ON
THIS SUBJECT PLEASE QUOTE NO **ADM/92/125/01**

THE REPUBLIC OF UGANDA

MINISTRY OF TOURISM, WILDLIFE AND ANTIQUITIES,
2nd FLOOR, RWENZORI TOWERS,
PLOT 6, NAKASERO ROAD,
P.O. BOX 4241 KAMPALA, UGANDA

19th August 2023

Ms Thea Carroll
Chief, Science Unit
CITES Secretariat
Palais des Nations
Avenue de la Paix 8-14
1211 Geneva 10
SWITZERLAND

REVIEW OF SIGNIFICANT TRADE IN SPECIMENS OF APPENDIX – II SPECIES [RESOLUTION CONF. 128 (REV. COP18)]

Reference is made to a letter from Secretariat to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Ref: DR/TC/RST/2023/UG, dated June 19th June 2023 regarding the above captioned subject.

Uganda reviewed the letter and wishes to respond as follows:

1. Uganda has not conducted any detailed inventory or Non-Detriment Findings (NDFs) for *Dalbergia melanoxylon*. Accordingly, Uganda has not formally processed or published any export quota involving the species. However, around May, 2023, Uganda received a request for export clearance from M/s JIDE Investments Co-SMC, Ltd. The company claimed to have an export offer to import into Uganda from Democratic Republic of Congo (DRC). The request was subsequently declined due to lack of legally acceptable documentation. Therefore, there is no documented export from Uganda.

2. Regarding *Osyris lanceolata*, Uganda implemented regulated harvesting and trade in this species from 2011 – 2015. The harvesting was facilitated by a Memorandum of Understanding (MOU) signed between Moroto District Local Government in Eastern Uganda and M/s Skybeam Co. Ltd, prior the listing of the species under Appendix II. Following expiration of the MOU, Government conducted and assessment in terms implementation of commitments and obligations under the MOU. It was noted that, the harvesting of the species was relatively unsustainable. Consequently, around

2018/2019, Government of Uganda resolved to institute a ban on local harvesting and trade in the species.

3. The position to enhance the ban on local harvesting and trade was further affirmed following a stock inventory and trade monitoring study in 2021 and 2020 respectively funded under the EU CITES Tree Species Programme which established a declining level of stocking and distribution. The assessment further revealed some illegalities involved in the trade in addition to other pressures from uses besides the oil extraction, including charcoal burning, firewood and land use change, mainly resulting from agriculture extension.

4. Under the Uganda Free Zones arrangement, another Company called Uganda Wood Impex was cleared to set up a processing plant and extract sandalwood oil exclusively using imported raw materials from other countries. The company has since been importing from Democratic Republic of Congo (DRC) and South Sudan. This constitutes all imports and re-exports from Uganda (see attached list of transactions).

5. Uganda therefore wishes to report that, all trade in *Osyris lanceolata* oil originating from Uganda has largely been based on imported raw material from other countries since the ban on harvesting and expiry of the MOU with Skybeam.

I hope the information provided will useful in assessing implementation of Article IV, paragraphs 2 (a), 3 and 6 (a) with regard to exports of *Dalbergia melanoxylon* and *Osyris lanceolata* from Uganda.

George Owoyesigire
CITES Management Authority-UGANDA

Copy: Chairperson Plants Committee
CITES Scientific Authority- Uganda

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IN ANY CORRESPONDENCE ON
THIS SUBJECT PLEASE QUOTE NO. **TW124/171/01**

THE REPUBLIC OF UGANDA

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21st December 2023

Ms. Ciara Stafford, PhD
Programme Officer - Nature Conserved
UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)
219 Huntingdon Road, Cambridge, CB3 0DL
UNITED KINGDOM

REVIEW OF SIGNIFICANT TRADE IN SPECIMENS OF APPENDIX-II SPECIES [Resolution Conf. 12.8 (Rev. CoP18)] - TRADE IN SANDALWOOD (*OSYRIS LANCEOLATA*) IN UGANDA

Reference is made to your recent letter dated 13th November 2023 requesting information on *Osyris lanceolata* from Uganda, which was selected for inclusion in the Review of Significant Trade following CoP19. The information provided in Uganda's published non-detriment finding for the species in May 2022 is still relevant and valid.

Distribution of *Osyris lanceolate*
Regarding additional information on *Osyris lanceolate* distribution in Uganda, the species has been recorded largely around the eastern part of Uganda in the Karamoja sub-region covering the districts of Amudat, Moroto, Kaabong, Kotido as well as the lower parts of Kapchorwa, Kween and Bukwe. It is also reported to exist in the Sango-bay areas in the Lake Victoria basin and Kabale in the southwest of Uganda. It is drought tolerant and grows to a height of 1-7 meters mostly on rocky soils, bushy lands and thickets, which is a common characteristic across the listed landscapes. Pockets of *O. lanceolata* trees are commonly localized and mainly found in rocky areas, which were void of lush vegetation at an altitudinal range of 1300-2000 masl. The last inventory was conducted in 2021 in Karamoja and Sebei regions and no follow up inventory has been conducted in this region or any other parts of the country to facilitate provision of new information.

Threats to the species (and any measures in place to reduce these threats), regulation
Locally, the tree is mainly used for charcoal, firewood, construction, cultural values and in the making of various tools and tool handles because of its wood carving potential as well as land use change. At international level, it is traded for its fragrance and mainly used in the making of perfumes, medicines with

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various applications in the pharmaceutical industry. Currently, there is a ban harvesting, trade and export of the species and its products from Uganda. However, there may be isolated cases of illegal trade with incidences of smuggled raw sandalwood being disguised as originating from Uganda. The only permitted exports from Uganda are processed products for re-export, like oil and spent dust using CITES cleared imported raw materials from neighbouring countries. Community engagements through farmer education and law enforcement have continued to increase appreciation of the species.

The administrative measures under the CITES framework in Uganda put in place to regulate trade in the species are observed by both Uganda Revenue Authority (customs) and the Interpol Division of the Uganda Police Force and are further supported by the National Forestry and Tree Planting Act, 2003, National Forest and Tree Planting Regulations, 2016, and the Uganda Wildlife Act, 2019 duly provide for conservation of endangered species.

Existence of stockpiles of Ugandan Sandalwood harvested before 2016

There are no existing stockpiles harvested before 2016 in Uganda. Between 2011 – 2015 Government of Uganda had signed a Memorandum of Understanding (MoU) with Skybeam Co. Ltd and Moroto District Local Government to facilitate harvesting and trade in sandalwood in Uganda. This was prior to listing of the species under Appendix III of CITES. Following expiry of the MOU, a joint verification was made by the Ministry of Water and Environment (Forestry Sector Support Department, Uganda Scientific Authority on plants), National Environment Management Authority and Uganda National Council for Science and Technology, who had been overseeing implementation of the MOU. The verification noted that, Skybeam Co. Ldt had not fulfilled some of the requirements and commitments as envisaged and agreed in the MoU. Skybeam Ltd was advised to process the remaining stock and halt operations specific conditions were met. The last batch of stockpiles belonging to M/s Skybeam Co. Ltd was exported in 2019 when the window for clearance elapsed. Uganda thus currently depends on regulated importation of raw material from neighbouring countries.

George Owoyesigire
CITES Management Authority - Uganda

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF NATURAL RESOURCES AND TOURISM

REVIEW OF SIGNIFICANT TRADE IN SPECIMENS OF APPENDIX II SPECIES [(RESOLUTION CONF. 12.8 (REV.COP 18)]

RESPONSE FROM THE UNITED REPUBLIC OF TANZANIA ON DALBERGIA MELANOXLON OSYRIS LANCEOLATA

AUGUST 2023, DODOMA

1.0 BACKGROUND

1.1 Forests Management in Tanzania

Forested land in Tanzania Mainland is estimated to 48.1 million ha (MNRT, 2015), which is equivalent to 55% of total surface land area. The forests are the extent of distribution based on forest types is as follows: Woodlands cover 44.6 million ha (93%) of the forestland while catchment forests; mangroves, coastal forests and government forest plantations occupy 3.4 million ha (7%). Furthermore about 20 million ha of the forestland is production forests and 28 million ha are protected forests found in forest reserves and other protected areas. The regeneration of natural forests is quite good – up to 3000 tree seedlings/wildings per ha. The growing stock is estimated as 3.3 billion m^3, of which closed forests account for 11.3% while woodlands account for 73.9%. The remaining 14.8% is accounted for by Trees outside Forests (ToF). Based on the forested land in Tanzania, the existing forest tenure arrangements are under central government (34.5%), local government (6.5%) and village governments (45.7%), private (7.3%) and unreserved forests (6.0%) (Table 1). The highest percentage of forestland is owned and managed by village governments. However, 19.67 million ha (89.8%) of forests in village lands is unreserved (open access forest areas) and is subjected to unsustainable practices such as agricultural expansion, wild fires, livestock grazing and illegal harvesting.

Table 1: Forest tenure arrangements in Tanzania

Tenure Holders	Area (ha) * 1000	Percentage (%)
Central Government	16,610.60	34.5
Local Government Authorities	3,107.40	6.5
Village Governments	21,975.10	45.7
Private Sector	3,515.90	7.3
General land (unreserved forests)	2,881.70	6
Total	48,090.70	100

1.2 Policy and Legal Framework

The primary obligation of Tanzania's forest policy is to have long term plans on the supply of wood raw materials for the industries and other uses. This advocates the need to strengthen the management of plantation forests by improving tending operations to ensure sustainable and good quality of raw material. Several initiatives has been conducted to overcome these challenges including developing strategies, plans, programmes such as the Forest Policy Implementation Strategy (2021-2026), TFS Strategic Plan (2020/2021-2025/2026), and MNRT Strategic Plan (2020/2021-2025/2026). In accordance with the National Forestry Policy of 1998, the Forest Act No. 14 of 2002 provides the legal framework to implement the National Forest Policy. Together with other objectives stipulated in the Act, the Forest Act (2002) aims to encourage the principles of sustainability in connection with the harvesting of forest produce. The Act obliges the establishment of forest management plans for all types of forests to ensure sustainable management in the long term. The legal bases under the Forest Regulations (2004) and the Government Notices made under Section 106(1) of the Forest Act, regulate harvesting and export of some tree species including *Dalbergia melanoxylon* except *Osyris lanceolata* which was banned since 2004 through Government Notice Number 335 of 10/09/20283 (Annex I). The regulation prohibits harvesting of *O. lanceolata* and restricts the export of its products unless the raw materials are imported and processed in the country. Also, the regulation prohibits the export of large consignments of *Dalbergia melanoxylon* raw wood unless it is in the form of semi-processed or finished products. It can be concluded here that given the existing raw material in both natural forests, plantations and farmlands and given improved management of the forests as well as policy and mills the role the wood industry plays to the national economy can significantly be increased.

1.3 Enforcement

Existence of policies and legal frame works that guides forest management in the country (as indicated in Section 1.2), provides smooth undertaking of enforcement strategies. The undertaking of the enforcement at various value chains of the trade of tree species in the country has been achieved as a result of good policy and legal framework environment, which enables develop of various enforcement tools. The enforcement tools available includes; check points on roads, log trucking systems, Antipoaching Unit, as well as the Joint Port Control Unit (JPCU). There is also Forest Surveillance Unit (FSU) that oversees enforcement of forest and beekeeping policy, law and regulation within TFS jurisdictions as per Agency Establishment Order of 2010 CAP 245 R.E.2022. The following are the functions of the Forest Surveillance Unit has the following major functions. To advice on matter related to intelligence, investigation and prosecution on forest crimes. To ensure compliance on harvesting and trade of forest products and services. To oversee the enforcement of forest policy and legislation. To review guidelines for licensing, revenue collection, quality control and assurance of forest products and services. To coordinate and review various document (leaflets, booklets, permits, forms) concerning timber trading. To record and report on illegal harvesting and trading activities and impose appropriate measures for the culprits and. To provide strategic direction on issues related to investigation concerning forest crimes.

1.4 Community Engagement

The National Forest Policy of 1998 and the Forest Act No.14 of 2002 together with associated regulations guide the forest sector in Tanzania. These two important forest governance instruments recognise Participatory Forest Management (PFM) as a strategy to achieve sustainable forest management through encouraging the management or co-management of forest and woodland resources by the communities living closest to the resources. The two instruments describe the aim of PFM as being "to delegate responsibility for the management of forest resources to the lowest possible level of local management consistent with the furtherance of national policies."

PFM in Tanzania comes in two main types namely Joint Forest Management (JFM) and Community-Based Forest Management (CBFM). Whereas JFM involves the co-management of Forest Reserves between government, which may be either the TFS or District Councils, and forest adjacent villages, CBFM is realized where local villages, or sub-groups within the village, are the sole forest owners and managers by virtue of establishing various forms of communally or privately reserved forests on village lands. As such, CBFM takes place on forests that are owned and managed by the Village Council on behalf of the Village Assembly and leads to the establishment of Village Land Forest Reserves (VLFR), Community Forest Reserves (CFR) or Private Forest Reserves (PFR). Under CBFM management scheme, villagers may decide to set aside, or "reserve" a forest area for a range of reasons. In some cases, it is because they have seen their forests declining through poor management or uncontrolled utilization. In other cases, communities may wish to set aside a bare area for forest restoration. Alternatively, as it is the case in the new generation of CBFM initiatives, villagers may wish to reserve their forest because it has significant economic potential and they wish to obtain tangible benefits from sustainable harvesting.

1.5 Role of the Forest Sector in the Economy

Forestry is one of key economic sectors in driving the national industrialization agenda and livelihood improvement. The sector has relatively great potential on promoting both rural and urban development. In addition, it has significant contribution to employment creation, Gross Domestic Product (GDP) and fiscal revenues. The sector has rich value chains with the potential to reduce the balance of trade deficit. In 2020, forest sector in Tanzania was estimated to have a total Gross Value Added (GVA) of TZS 4.65 trillion, contributing about 3.3% (Annex II) to the national Gross Domestic Product (GDP) (MNRT, 2021). The value is from different products including charcoal, firewood, logs, poles, honey and beeswax, wild fruits, gums and resins, withies, seeds and seedlings production.

Logs were harvested from woodlots, plantations and natural forests which had a value of GVA TZS 189,541,323,923 which is equivalent to 4.08% of the forest sector contribution. *Dalbergia melanoxylon* Guill. & Perr. is among tree species harvested from natural forests in the country processed into either sawn wood or clarinets from harvested logs. Value chain of *Dalbergia melanoxylon* Guill. & Perr. includes different people within different social groups who are directly or indirectly involved including youths, women, marginalised and disabled social group of which all of them earn income within the value chain of *Dalbergia melanoxylon* Guill. & Perr. The revealed contribution to the GDP is also due to its recorded economic value. Therefore, *Dalbergia melanoxylon* Guill. & Perr. being among the tree species harvested within the natural forests has also significant contribution to the national economy.

1.6 Why this response to CITES Secretariat

The respond is done to the secretariat in order to fulfil the requirement by CITES Plants Committee as per Resolution Conf. 12.8 (Rev. CoP 18) on the review of significant Trade in Specimen of Appendix II species by reviewing the biological and trade information of Appendix II species subject to significant levels of trade in order to identify problems and solutions concerning the implementation of Article IV, para 2(a), 3 and 6(a) of the conversion. The report provides record levels of direct export for

Appendix II Species during the five most recent years, mainly for *Dalbergia melanoxylon* Guill. & Perr. as it has been in trade up to recently. On the other hand, there is no NDF developed for *Osyris lanceolata* Hochst. & Steud. as currently there is no trade done for this species. Harvesting of this plant in Tanzania was banned in 2004 (Annex I) due to realisation that the population of the species was not sufficient to demonstrate sustainability if exploitation could continue. However, there are four primary wood industries processing *Osyris lanceolata* Hochst. & Steud., but raw materials used are not from the United Republic of Tanzania, but there is another tree species which is not CITES Appendices listed species (*Santalum album* L. (Indian sandalwood)) and some wood materials from Congo DRC (Annex III). Therefore, report provides the scientific basis by which the United Republic of Tanzania established that exports of *Dalbergia melanoxylon* Guill. & Perr. and *Osyris lanceolata* Hochst. & Steud. from the country are not detrimental to the survival of the species concerned and are compliant with Article IV of CITES. In that regard, the Tanzania Forestry Research Institute (TAFORI) which is the Scientific Authority for Plant Species as provided for under the Wildlife Conservation (CITES Implementation) Regulations of 2018 is responsible for leading development of NDFs and other reports for CITES Appendix II species.

2.0 DETAILED REVIEW ON SIGNIFICANT REVIEW OF TRADE

2.1 DALBERGIA MELANOXLON

2.1.1 Decision -making – (NDF) process

2.1.1.1 How the Scientific Authority makes an NDF

The NDF of a particular species harvested in a particular forest management unit is developed based on the forest resource data obtained during inventories. The forest resource data provides estimates of forest stocking parameters mainly the number of stems and volume (m^3) per hectare that is distributed along the diameter classes (see Table 3). The distribution in diameter classes shows how a particular tree to be harvested is distributed among young (regenerants) to mature stems. If the data does not demonstrate presence of enough regeneration, NDF becomes negative and harvesting is not permitted until the Scientific Authority demonstrates possibilities of regeneration of a particular species. The following simplified guidance has been in use in making NDF of a particular species:

1. Information from which forest the timber comes from and how many companies are harvesting the species concerned in the respective forest- management unit.
2. Month and year of harvest
3. Management plan of the forest, valid for the time when the timber was harvested, and provided in English; this should contain if possible.
   a) Location of the harvest site or sites;
   b) Information on the population size and structure of this species in the harvest locations;
   c) Natural generation rates and annual growth rate of the species;
   d) How sustainable harvesting is assessed at the harvest site;
   e) Monitoring and management measures in place at the harvest site; and
   f) Information on the permitted volume to be harvested, actual harvested volume within the respective financial year and the approved volumes to be exported.

The Scientific Authority makes an NDF for timber species based on the Nine Steps Guidance for making NDF by Wolf *et al.* (2018). Since, most of the importers of wood products are from the EU region, guidance for making NDF from CITES EU Office are being used as well.

2.1.1.2 Details, and role of any institution(s)/expert(s)/Stakeholders involved in making the NDF, other than your designated Scientific Authority

During making NDF in Tanzania, there are several institutions and stakeholders (apart from the Scientific Authority) involved as indicated in the Table 2.

Table 2: Institutions/stakeholders involved in making NDF

SN	Name of the institution/Stakeholder	Role
1	Division of Forestry and Beekeeping	Provides policy and legal framework documents as well as guidelines that are used as reference during development of NDFs.
2	Tanzania Forest Services Agency (TFS)	Provides information on the resource status as well as other information about the forest where the wood will be harvested as well as the amount of wood to be harvested.
		Provides forest management plans and harvesting plans for forest reserves under the central Government
		Certifies wood products before exportation
		Provides trade records of forest produce
3	Academic institutions (Universities and Collages with related natural resources programmes)	Provide scientific data on forest resources in the country
		Involved in plant identification
		Provide information on the status of forest, harvest and trade dynamics from the research and consultancies they conduct
4	Village Government	Provides trade records of forest produce
		Provides information on forest assessment, legal and illegal trade
5	Non-Governmental Organisations (NGOs) dealing with forest management including Mpingo Conservation Development Initiative (MCDI), Tanzania Forest Conservation Group (TFCG), World Wide	Provide information on the status of forest management in Village Land Forest Reserves.
		Provide training and awareness on issues related to forest management and forest resource assessment

	Fund for Nature, TRAFFIC to mention few.	
6	Private sector	Provide information regarding the demand for the forest products, trade dynamics and specific requirements by importing countries.

2.1.1.3 How the Scientific Authority monitors the level of exports

The Scientific Authority monitors the levels of exports through export records documented in the system managed by the Management Authority for Plant Species (TFS). The Authority is making use of records generated from the CITES Export, Import and Re-Export database managed by the CITES Management Authority. This system captures all the information regarding export, import and reports of all CITES listed species in Tanzania. This information is used to assess allowable harvest, actual harvest and export to determine trade volume and advise the management authority as appropriate.

Likewise, Monitoring is done during making of the NDF as all Forest Management plans and Harvesting plans are in place. Therefore, the is involved in assessing the level of the implementation of these plans to ensure that harvest is sustainable.

2.1.3 Population

2.1.3.1 Conservation status of the species in the country

Review on *Dalbergia melanoxylon* Guill. & Perr. indicated that, the tree species is among the Miombo woodlands trees species managed in National Forest Reserves, Village Land Forest Reserves (VLFRs) and in general lands. Figure 1, show distribution of Miombo woodlands in Tanzania, of which *Dalbergia melanoxylon* Guill. & Perr. is among them. The Woodlands cover 44.7 million ha (out of 48.1 million ha of total forest area in Tanzania) and contain 73.9% of the growing stock.

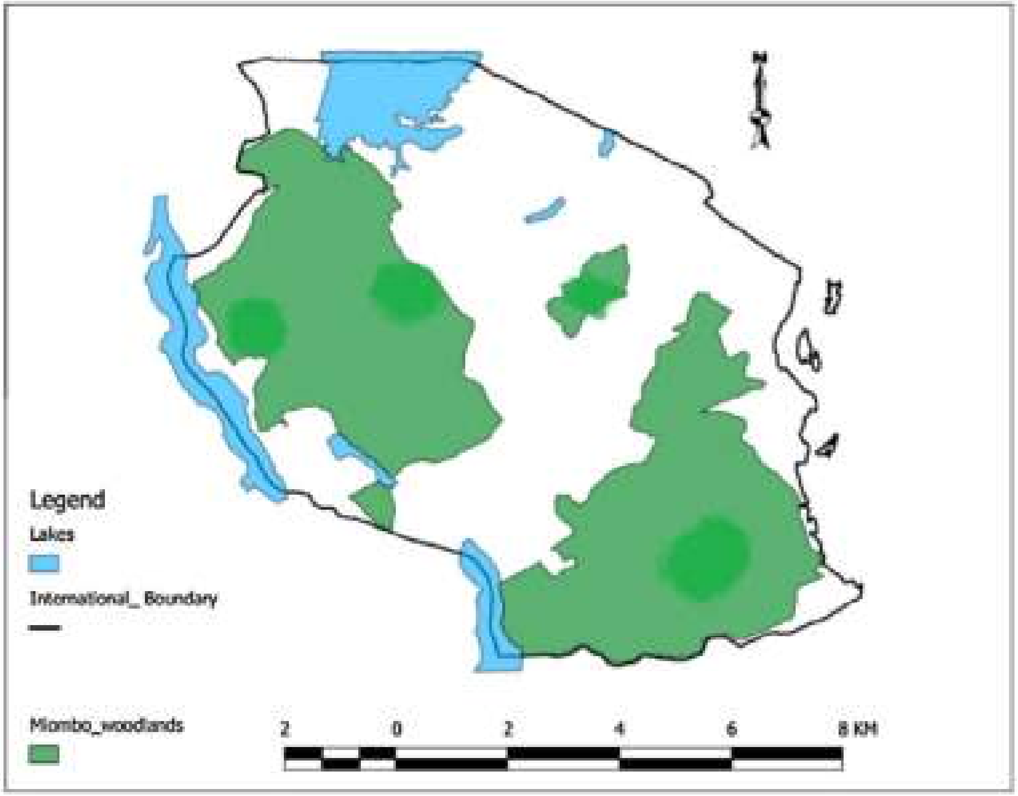

Figure 1: Distribution of Miombo woodlands in Tanzania (Source: MNRT, 2015)

Referring to the growing stock, the International Union for Conservation of Nature (IUCN) Red List of Threatened Species 1998, has listed *D. melanoxylon* Guill. & Perr. as Near Threatened (NT) species. This indicates that the species is considered threatened with extinction in the near future, although it does not currently qualify for the threatened status.

According to the National Forest Resources Monitoring and Assessment (NAFORMA) of Tanzania (MNRT, 2015) (Annex IV), distribution of *D. melanoxylon* Guill. & Perr in terms of total number of stems and volume is 1,319,026,007.79 and 22,940,996.28 (m^3), respectively (Table 3; Figure 2 & 3). The distribution indicates that there is a good proportion of distribution of trees in the different diameter classes indicating normal tree recruitment expected in natural forests. The report further indicate that *Dalbergia* sp was among the twenty most common tree species of all observed trees species in all vegetation types (MNRT, 2015).

Table 3: Distribution of number of stems and volume (m^3) of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania

SN	Dbh Classes (cm)	Number of Stems	Volume (m^3)
1	0-9.9	1,215,080,157.55	6,240,975.36
2	10-19.9	81,840,477.37	6,798,682.73
3	20-29.9	16,799,976.82	4,624,834.12
4	30-39.9	3,293,232.19	2,146,496.06
5	40-49.9	1,350,005.68	1,469,865.33
6	50-59.9	389,156.79	638,362.44
7	60-69.9	106,572.53	279,113.41
8	70-79.9	74,178.58	283,968.02
9	80-89.9	92,250.28	458,698.80
Total		**1,319,026,007.79**	**22,940,996.28**

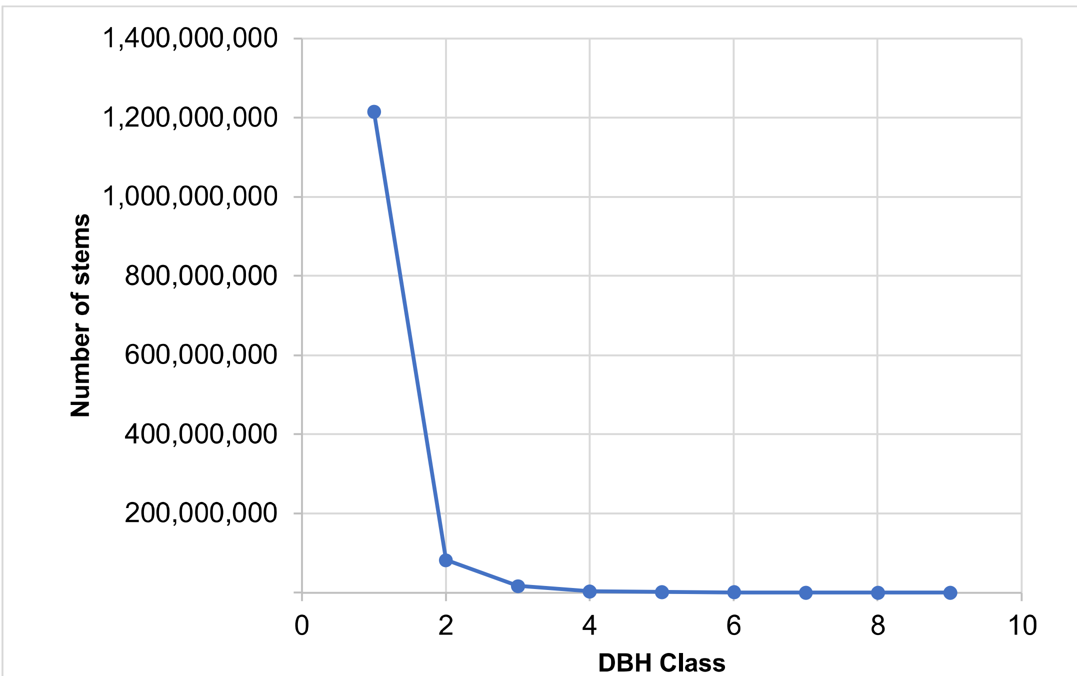

Figure 2: Distribution of number of stems of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania in different DBH classes (Refer Table 3)

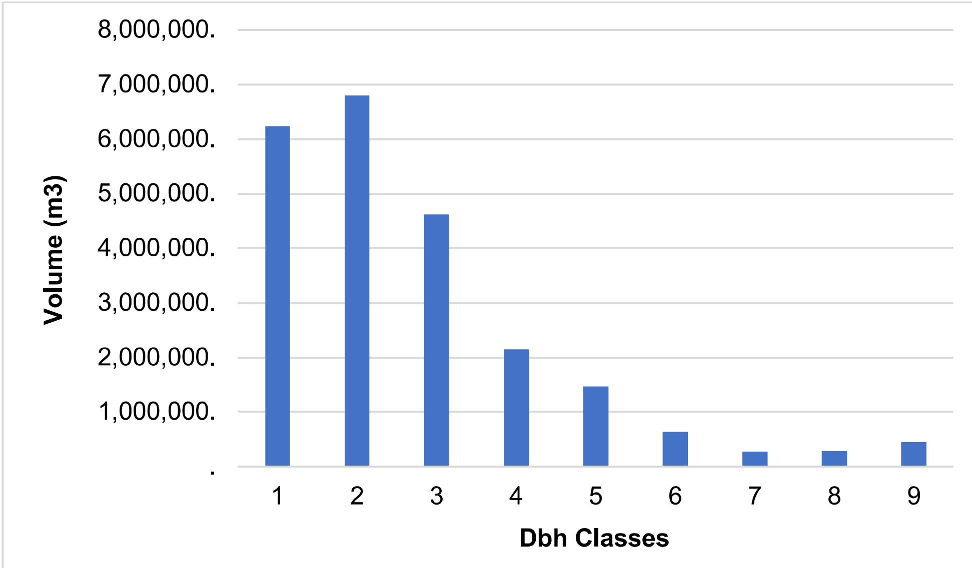

Figure 3: Distribution of number of volume (m3) of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania in different DBH classes (Refer Table 3)

According to the National Forest Regulations (URT, 2004), minimum harvestable tree diameter is 24 cm, therefore referring to Table 3, diameter class from 20 - 29.9 cm and above are recommended for harvesting. This depicts that there is enough harvestable wood in Tanzania.

2.1.3 Threats

2.1.3.1 Known threats to the species in the country

Dalbergia melanoxylon Guill. & Perr. has no serious threats while in the field. However, few threats have been reported by various scholars (Table 4).

Table 4: Known threats of *Dalbergia melanoxylon* Guill. & Perr.

SN	Threats	Measures to reduce the threats
1	Wild fires reduce regeneration considerably, as the trees grow slowly	Early burning to reduce biomass, control line and the use of satellite in detecting and control of wild fire
2	Heart rot disease to some logs show due to fungal infection after fire damage	This is natural, and it occurs to few trees, so far, no measures have been taken.
3	Boring of logs due to tunnel-boring larvae of cerambycid beetles' infections	Control by use of physical check-up of logs in the log yards
4	Browsing on the leaves and young shoots by numerous herbivores including large mammals therefore affecting regeneration	This is a natural phenomenon, nature is taking place.

2.1.4 Trade

2.1.4.1 Information on the levels of legal trade in the species in the 5 most recent years

For the period of five years, Tanzania has exported 18,374.88 kg and 8,584.69 m^3 of *Dalbergia melanoxylon* Guill. & Perr. wood in different countries in the world (Table 5). The wood exported were in terms of weight (when exporting mainly carvings) and volume (when exporting clarinets and sawn wood). The data indicate actual trade for the past five financial years. The fluctuations for amount of wood exported/traded is due to variations in number of timber dealers and amount of wood licenced to be harvested in a particular financial year, normally it depends on the order in place. Also, prevalence of COVID 19 reduced normal trade of wood, due to lockdown in some importing countries.

Table 5: Amount of *Dalbergia melanoxylon* Guill. & Perr. wood traded (exported) during the recent five financial years

SN	Financial Year	Amount Wood Traded	
		***Weight (kg)**	****Volume (m^3)**
1	2018 - 2019	2,124.00	-
2	2019-2020	6,820.50	73.761
3	2020-2021	1,679.69	8,201.8
4	2021-2022	4,766.83	191.56
5	2022-2023	2,983.86	117.57
	Total	18,374.88	8,584.69

*Mostly carvings
**Clarinets and sawn wood

2.1.4.2 Levels of illegal trade (known, inferred, projected, estimated)

There is no evidence of occurrence of illegal trade of *Dalbergia melanoxylon* Guill. & Perr. wood recorded in and outside the country. The species is plenty, domestic trade is regulated, equally to international trade, control exist at exit points, show that there is no evidence of seizure of *Dalbergia melanoxylon* Guill. & Perr. outside the country, that could be the bases for your justification that there is no illegal trade.

2.1.4.3 Procedures for identification of specimens in trade to the species level

Species identification is done through plant identification procedures at local and national levels. At local level plant identification starts at local communities and later at national level through developed plant checklists and other available documentations in Tanzania. Through participatory Forest Management Programme, communities are trained on the identification of *Dalbergia melanoxylon* Guill. & Perr before harvest and after harvesting. Likewise, the traditional knowledge is applied in the identification of *Dalbergia melanoxylon* Guill. & Perr using the local names commonly used in a specific area with the assistance of Forest Officers.

During transportation of the wood, identification at checkpoints and ports is done through experts in place. The experts have been trained to identify *Dalbergia melanoxylon* Guill. & Perr. wood. Also, the *Dalbergia melanoxylon* Guill. & Perr. wood (at its original state) is distinct from other woody tree species harvested in Tanzania in terms of density and colour. The plant and the wood can be easily identified by experts through normal sight.

Apart from that, tree identification also follows guidelines set at international level, including the Nine Steps Guidance for making NDF by Wolf *et al.* (2018).

2.1.4.4 Information on any export quota in place for the species and details for 5 most recent years, if not already published on the CITES website.

Information on export quota for *Dalbergia melanoxylon* Guill. & Perr. is normally indicated in Forest Harvest Plans in respective forest management units. Based on data in Table 3, forest management units have been prepared based on sustainable utilisation of the resources.

2.1.4.5 Include information on how captive-produced or artificially propagated specimens are distinguished in trade from wild-harvested specimens, if applicable.

This is not applicable to *Dalbergia melanoxylon* Guill. & Perr. as far as there are no captive-produced or artificially propagated specimens of the species.

2.1.5 Species management (wild harvest)

2.1.5.1 Information on harvest/trade management measures currently in place (or proposed), including any monitoring programmes, threat evaluations, adaptive management strategies and considerations of levels of compliance, and/or harvest or trade quotas (both for domestic and international markets including how quotas are determined and how they are allocated regionally, if applicable).

Harvesting of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania is governed by the National Forest Policy (1998), Forest Act (2002) and Forest Regulations (2004). Through these legal documents, is where various guidelines and plans are developed. Forest management plans and harvesting plan are the documents used to monitor harvesting/trade of the species. The Forest Harvesting Plan, is where the allowable cut (harvesting quota) is indicated for each year. On the other, wild fire monitoring system is in place, that is used to oversee of trees and wood resources against wild fire incidences. The system is very useful as it provides alerts if there is any occurrence of wild fires.

2.1.5.2 Details of capture methods/rates of mortality pre-export (i.e. during/post capture) and how this is taken into account in the NDF

This is not applicable to *Dalbergia melanoxylon* Guill. & Perr. as fas as the species is exported in terms of dead wood.

2.1.6 Species management (ranched specimens)

2.1.6.1 Informatioin on management of ranched animals in trade

This is not applicable to *Dalbergia melanoxylon* Guill. & Perr. as far as the species under discussion is a tree not an animal.

2.1.7 Laws and regulations

2.1.7.1 Details of national or sub-national laws and regulations for the species relating to harvest

Harvesting of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania is governed by the National Forest Policy of 1998 (Annex V), the Forest Act No. 14 of 2002 (Annex VI) and Forest Regulations of 2004 (Annex VIII). These legislations provide provisions for the ownership and harvest of forest. According to the Forest Act No. 14 of 2002, ownership of forest in Tanzania fall mainly under the following categories: (i) Central Government, (ii) Local Government, and (iii) Private. In that regard, harvesting of *Dalbergia melanoxylon* Guill. & Perr. is practised in natural forests under the Central Government and Local Government. The Tanzania Forest Services Agency (TFS) is an institution under the Ministry of Natural Resources and Tourism that manages forests under Central Government. While for the Local Government forests, Village Govenments are responsible for the management of forests. The latter have been gazetted as the Village Land Forest Reserves. In all forest under different ownership, harvesting of the forest is subject to exisitence of active forest management plan as well as forest harvesting plan documents.

2.1.7.2 Details on national or sub-national laws and regulations for the species relating to trade

Trade of *Dalbergia melanoxylon* Guill. & Perr. at local and international level is governed by the National Forest Policy of 1998 throught Policy Statement (14) which states that "*Internal trade and exports of forest produce, excluding those regulated by international agreements of Tanzania is a party, will be promoted. To prevent forest destruction and degradation through commercial exploitation, trade of cetain forest products may be regulated*". Through the this forest policy, the Forest Act No. 14 of 2002 was inacted. Through this Act, the Forest Regulations are made under Section 106(1). The Forest Regulations are developed based on the need. For instance, the Government Notice Number 266 of 31 March 2023 has detailed provisions for trade of timber in Tanzania (Annex VIII). The Regulation provide rules for transportation of forest products into and outside of the country. This regulation provide guidance for sustainable trade of various tree species including *Dalbergia melanoxylon* Guill. & Perr. Other specific regulations, guidelines and strategies are as indicated in Section 1.3.

2.1.8 Conclusion

The scientific authority makes NDF based on global guidelines in place. A number of stakeholders have been involved during making of NDF including Government Institutions, local communities (village government), academic institution, Non-Governmental Organisations and private sectors. The Scientific Authority monitors the levels of exports through export records documented in the system managed by the Management Authority for Plant Species (i.e. TFS). The population of D. melanoxylon Guill. & Perr. in terms of total number of stems and volume is 1,319,026,007.79 and 22,940,996.28 (m^3), respectively. The distribution indicates that there is a good proportion of distribution of trees in the different diameter classes indicating normal tree recruitment expected in trees at the wild (natural forests). The distribution further provides information about distribution of young and mature trees at normal proportion, denoting that good management of the trees in the forests. For the period of five years, a total of 18,374.88 kg and 8,584.69 m^3 of wood were exported in terms of weight (when exporting mainly carvings) and volume (when exporting clarinets and sawn wood). Harvesting and trade of the wood have been regulated/guided by available policies, legal frameworks, various guidelines as well as strategies at national of sub national level. Thus, based on resource availability of *Dalbergia melanoxylon* Guill. & Perr. in Tanzania as well as supportive policy, legal frameworks and strategies provide evidence that trade of the species is not detrimental to the survival of the species.

2.2 OSYRIS LANCEOLATA

2.2.1 Decision -making – (NDF) process

2.2.1.1 How the Scientific Authority makes an NDF

Details on how the Scientific Authority makes NDF is a indicated in Section 2.1.1.1. The procedures apply to all woody species.

2.2.1.2 Details, and role of any institution(s)/expert(s)/Stakeholders involved in making the NDF, other than your designated Scientific Authority

List of institutions/experts and their roles during making NDF is as indicated in Section 2.1.1.2.

2.2.1.3 How the Scientific Authority monitors the level of exports

The Scientific Authority monitors the level of exports as per Section 2.1.1.3.

2.2.2 Population

2.2.2.1 Conservation status of the species in the country

Review on *Osyris lanceolata* Hochst. & Steud. indicated that, the tree species is managed in reserved national forest reserves, Village Land Forest Reserves (VLFRs) and in general lands (i.e. on unplanned lands which are subject any time to different land uses). On the other hand, the International Union for Conservation of Nature (IUCN) Red List of Threatened Species 1998, has listed *D. melanoxylon* Guill. & Perr. as of Least Concern (LC) species.

The population of *Osyris lanceolata* Hochst. & Steud. in Tanzania does not signify harvesting for trade. Currently, harvesting of *O. lanceolata* Hochst. & Steud. is not allowed due to the dwindling in population of the species. Table 6 indicates diameter class (cm) distribution of *O. lanceolata* Hochst. & Steud. in terms of number of stems and volume (m^3) in Tanzania. The *O. lanceolata* Hochst. & Steud. occupied only the first diameter classes (Table 6) indicating that most of the trees are of small diameter, therefore not suitable for harvesting. Among those trees, some are found in protected areas (most being those occupying the second diameter class - (10 - 19.9 cm)), where utilization of the trees is prohibited.

Table 6: Number of stems (N) and volume (m^3) per hectare of *Osyris lanceolata Hochst. & Steud.* in some regions of Tanzania

Zone	Region	Diameter classes (cm)				Total	
		01. (0 - 9.9 cm)		02. (10 - 19.9 cm)			
		Number of Stems	Volume (m^3)	Stems	Volume (m^3)	Number of Stems	Volume (m^3)
Eastern	Dar es Salaam	-	-	-	-	-	-
Eastern	Morogoro	152,990.14	1,147.16	-	-	152,990.14	1,147.16
Eastern	Pwani	113.49	2.65	-	-	113.49	2.65
Southern	Lindi	2,004.93	46.79	155.36	6.86	2,160.29	53.65
Southern	Mtwara	756.58	17.66	310.71	13.71	1,067.29	31.37
Southern	Ruvuma	22,498.55	168.70	-	-	22,498.55	168.70
Southern Highlands	Rukwa	23,623.48	177.13	-	-	23,623.48	177.13
Southern Highlands	Njombe	190,636.79	3,460.34	116,116.75	5,123.75	306,753.54	8,584.09
Southern Highlands	Iringa	97,868.69	733.84	-	-	97,868.69	733.84
Southern Highlands	Mbeya	28,685.65	215.09	-	-	28,685.65	215.09
Central	Manyara	9,000.39	103.14	2,951.77	130.25	11,952.16	233.39
Central	Dodoma	74,245.22	556.71	-	-	74,245.22	556.71
Central	Singida	7,506.14	68.27	932.14	41.13	8,438.28	109.40
Lake	Mara	-	-	1,864.27	82.26	1,864.27	82.26
Lake	Simiyu	3,374.78	25.30	155.36	6.86	3,530.14	32.16
Lake	Mwanza	151.32	3.53	155.36	6.86	306.67	10.39
Lake	Kagera		-	-	-	-	-
Lake	Geita	699.84	16.33	155.36	6.86	855.19	23.19
Western	Shinyanga	208.06	4.86	-	-	208.06	4.86
Western	Kigoma	20,248.70	151.83	3,767.39	166.24	24,016.08	318.07
Western	Katavi	23,623.48	177.13	1,359.37	59.98	24,982.84	237.12
Northern	Kilimanjaro	50,621.74	379.57	2,019.63	89.12	52,641.37	468.69
Northern	Arusha	68,055.08	572.62	-	-	68,055.08	572.62
Northern	Tanga	77,620.00	582.01	-	-	77,620.00	582.01
Total		**854,533.03**	**8,610.67**	**129,943.45**	**5,733.86**	**984,476.48**	**14,344.54**

2.2.3 Threats

2.2.3.1 Known threats to the species in the country

Most of *O. lanceolata* Hochst. & Steud. populations occur on the public/general lands where there is little government control in terms of harvestings and management. The general lands (unplanned lands) are subject to change for various uses, thus threatening sustainability of the tree species. These species provide high value essential aromatic oil used as fragrance, herbal and cosmetic ingredient, but exploitation involved uprooting of whole tree, in that effect there is no any management initiative introduced. Currently, the Tanzania Forestry Research Institute (TAFORI) is implementing a project on developing regeneration protocol for *O. lanceolata* Hochst. & Steud. The protocol will be a base for regeneration initiatives to be implemented in the country for *O. lanceolata* Hochst. & Steud.

3.2.4 Trade

3.2.4.1 Information on the levels of legal trade in the species in the 5 most recent years

There is no trade of *O. lanceolata* Hochst. & Steud. that is harvested from Tanzania forests.

3.2.4.2 Information on levels of illegal trade (known, inferred, projected, estimated)

There is no *O. lanceolata* Hochst. & Steud. harvested from Tanzania forests.

3.2.4.3 Procedures for identification of specimens in trade to the species level

Species identification is done as detailed in Section 2.1.4.3.

3.2.4.4 Information on any export quota in place for the species and details for 5 most recent years, if not already published on the CITES website. Please explain any cases where the quota has been exceeded.

Currently there is no harvesting of *O. lanceolata* Hochst. & Steud. done in Tanzania forests. All processed materials are not listed under CITES Appendix II species.

3.2.4.5 Include information on how captive-produced or artificially propagated specimens are distinguished in trade from wild-harvested specimens, if applicable

This is not applicable to this species, as *O. lanceolata* Hochst. & Steud. is not captive produced or artificially propagated.

3.2.5 Species management (wild harvest)

3.2.5.1 Provide information on harvest/trade management measures currently in place

Harvesting of *O.* Hochst. & Steud. in Tanzania forests has been banned (Annex I). This is internal control to ensure that the trees are encouraged to recruit. No industries is licenced to process *O. lanceolata* Hochst. & Steud. sourced from Tanzania.

3.2.5.2 Details of capture methods/rates of mortality pre-export (i.e. during/post capture) and how this is considered in the NDF

This is not applicable to *O. lanceolata* Hochst. & Steud. as far as the species is exported in terms of essential oil. However, this is not done at the moment as explained in Section 3.2.7.

3.2.6 Species management (ranched specimens)

3.2.6.1 Provide information on management of ranched animals in trade

This is not Steud. as far as the species under discussion is a tree not an animal.

3.2.7 Laws and regulations

3.2.7.1 Details of national or sub-national laws and regulations for the species relating to harvest

Harvesting of Harvesting of *O. lanceolata* Hochst. & Steud. in Tanzania is governed by the National Forest Policy (1998) as well as the Forest Act (2002) and its Regulations of 2004. However, currently harvesting of *O. lanceolata* Hochst. & Steud. is not allowed. This is among the internal controls to enable the tree to recruit.

3.2.7.2 Details on national or sub-national laws and regulations for the species relating to trade

Trade of *O. lanceolata* Hochst. & Steud. at local and international levels is governed by the National Forest Policy (1998) through the Forest Act (2002) and its Forest Regulations of 2004. The Government Notice Number 266 of 31 March 2023 has detailed provisions for trade of forest produce in Tanzania. Despite existence of such regulatory frameworks of the trade, the Government banned harvesting of *O.*

lanceolata Hochst. & Steud. wood from Tanzania forests as a control measure to enable recruitment of the trees to take place.

3.2.8 Conclusion

The population of *Osyris lanceolata* Hochst. & Steud. in Tanzania does not signify harvesting for trade. Review of its stocking in the field in terms of number of stems and volume (m^3) was skewed on small diameter class, indicating that most of the trees are of small diameter, therefore not suitable for harvesting. Thus, based on dwindling resource availability of *Osyris lanceolata* Hochst. & Steud. from Tanzania as well as the Forest Regulations through its Government Notice Number 335 of 10/09/2023 (Annex I), harvesting of the species at the moment may cause detriment effects.

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TAXON/COUNTRY COMBINATIONS SELECTED FOR REVIEW BY THE PLANTS COMMITTEE FOLLOWING COP19*

The CITES Secretariat commissioned UNEP-WCMC to prepare this assessment under the current Project Cooperation Agreement.

The CITES Secretariat and UNEP-WCMC would like to thank the range States and other experts who provided valuable data and opinions in the compilation of this report.

*\u2003*The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Contents

Executive summary

This report provides accounts for seven plant taxa that were selected for inclusion in Stage 2 of the CITES Review of Significant Trade (RST) at the 26th meeting of the Plants Committee. It aims to assist the Plants Committee in categorising species/country combinations based on the effects of international trade, and to highlight problems concerning the implementation of Article IV of the Convention.

The UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) was asked by the CITES Secretariat to compile reviews for 14 of the plant taxon/country combinations (Table i) that were selected for inclusion in Stage 2 of the RST following CoP19. All range States were consulted by the CITES Secretariat and later by UNEP-WCMC, and asked to provide information on the scientific basis by which they had established that exports were non-detrimental and compliant with Article IV. Range States were also asked to provide details of the population status and threats to the relevant taxon within their country, as well as information on trade, legal protections, management and monitoring.

Table i: Taxon/country combinations that UNEP-WCMC was requested by the CITES Secretariat to compile reviews for.

Species	Country
Dalbergia melanoxylon	Mozambique, United Republic of Tanzania
Dalbergia tucurensis	Nicaragua
Guibourtia tessmannii	Cameroon, Equatorial Guinea
Osyris lanceolata	Burundi, Ethiopia, Uganda, United Republic of Tanzania
Aquilaria crassna	Viet Nam
Aquilaria malaccensis	Indonesia, Malaysia
***Gyrinops* spp.**	Indonesia, Papua New Guinea

Each taxon/country combination was assigned one of three provisional categorisations (‘*Action is needed*’, ‘*Unknown status*’ and ‘*Less concern*’), in accordance with paragraph 1(e) of Resolution Conf. 12.8 (Rev. CoP18). For the 14 combinations reviewed:

- Nine are provisionally categorised as ‘**Action is needed**’ on the basis that available information suggests that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a), are not being implemented;
- Four are provisionally categorised as ‘**Less concern**’, either because available information suggests that the provisions of Article IV paragraph 2 (a), 3 or 6 (a) are being implemented, or on the basis that no wild-sourced trade (codes W, R, U and source unreported) is anticipated.
- One combination was provisionally classified as ‘**Unknown status’**, on the basis that available information was insufficient to determine whether or not the provisions of Article IV paragraph 2 (a), 3 or 6 (a) are being implemented.

A summary of findings and a justification for the provisional categorisations of each of the 14 combinations under review is provided in Table ii.

Table ii: Recommended categorisations for 14 taxon/country combinations that were selected for Stage 2 of the RST following CoP19, based on the effects of international trade and problems concerning the implementation of Article IV.

Taxon	Range State under Review (Response received to the consultation?)	Summary	Provisional category
		FABALES	
		LEGUMINOSAE	
Dalbergia melanoxylon	Overview	Globally **Near Threatened** (2020 assessment), with a decreasing population trend, based on a suspected population decline of 20-30% over the last three generations (150 years); an additional decline of 20-30% by 2120 was projected based on significant ongoing logging in Mozambique and the United Republic of Tanzania.	
	Mozambique (No response received)	*D. melanoxylon* is widely distributed throughout Mozambique but is most abundant in the north, notably within Cabo Delgado province, where the only commercial stands remain. No national inventory data were located for the species, but a 2015 study reported a density of one tree/ha in central Mozambique. A 2015-2017 multi-species forest inventory found national forest stocks overall to have a reverse J-shaped size class distribution, suggesting adequate potential for recruitment, but species-specific information is lacking and the recruitment status of *D. melanoxylon* is unknown. *D. melanoxylon* is a valuable and important commercial species. Past overharvest for the international musical instrument industry has led to commercial extirpation in some areas of Mozambique, and legal and illegal export for the Chinese hongmu furniture market is reportedly significant and increasing. Illegal logging appears to account for a substantial proportion of total national forestry, with estimates ranging from 50% to 93%. The species' miombo woodland habitat is also subject to degradation and clearance for agriculture. Mozambique has submitted all annual reports to CITES for the period 2017-2021; the 2022 report had not yet been received at the time of writing. Mozambique has not published any CITES export quotas for this species. Direct trade 2017-2022 principally comprised wild-sourced timber for commercial purposes, amounting to 879 264 kg, 79 821 m^3, and 3.91 million pieces according to Mozambique. While Mozambique reported trade almost entirely as timber, importers reported wild-sourced logs (28 369 m^3) and sawn wood (11 075 m^3). The 2016 national harvest quota for the species was set at 1845 tonnes, and a total annual allowable cut (AAC) for the period 2015-2017 was set at 20 040 m^3; however more recent figures could not be located, and it is unclear how harvest quotas and the annual allowable cut relate to each other. A minimum exploitable diameter of 20 cm DBH is in place, however no information was located regarding a minimum recovery rate, minimum density for exploitation, or the parameters used to set the felling quota or AAC. *D. melanoxylon* does not appear to be grown in plantations in Mozambique.	**Action is needed**

Dalbergia melanoxylon (cont.)	Mozambique (cont.)	The population size and regeneration status of *D. melanoxylon* in Mozambique are unknown, but commercial stands are reported to only remain in one province. Mozambique is the source of the majority of *D. melanoxylon* exported for the hongmu market, and international demand for the species from the musical instrument market appears to remain significant. The basis for non-detriment findings for export of *D. melanoxylon* are unclear, therefore categorised as **Action is needed.** Illegal harvest and timber smuggling appear substantial in the national forest sector representing a concern not related to the implementation of Article IV.	
	United Republic of Tanzania (Response received)	*D. melanoxylon* occurs most frequently in miombo woodland, which is distributed throughout the south, west and southeast of the United Republic of Tanzania (hereafter Tanzania). The largest stands were reported from the southeast where commercial harvest is concentrated; extirpation of commercially valuable stems in the Rufiji district in the east was reported as a result of overharvest. The country's 2015 national forest inventory estimated a total population size of 1.3 billion *D. melanoxylon* stems, corresponding to a timber volume of 22.9 million m^3. Size class distributions at the time of the survey represented a reverse J-shaped curve, indicating high potential for recruitment (which is usually suggestive of low trade impact). A second national forest inventory is planned, although the timetable for completion is unknown. A survey conducted in 2017 in southeast Tanzania reported population densities of 32-57 *D. melanoxylon* trees/ha, and occurrence of large trees >50 cm diameter at breast height (DBH). Although Tanzania did not report any serious threats to *D. melanoxylon* and noted that the species is not illegally logged, multiple sources have raised concerns regarding overharvest; the IUCN Red List assessment, for example, forecast that continued high demand could lead to the commercial exhaustion of national stocks in future. Miombo woodland in the country is also subject to forest conversion for agriculture and degradation from wildfires. Tanzania has submitted all annual reports to CITES for the period 2017-2022 except for 2021, and has not published any CITES export quotas for this species. Direct exports 2017-2022 principally comprised wild-sourced sawn wood (reported as 72 762 kg, 578 m^3, and 8700 units) and timber (44 400 kg) traded for commercial purposes as reported by Tanzania. Direct trade as reported by importers mostly consisted of 223 941 wood products and 107 080 kg of sawn wood. Non-detriment findings (NDFs) appear to be made at the level of individual forest management units. A minimum exploitable diameter has been set at 24 cm DBH, and exports are only permitted from sites with management plans that include information on population size and structure, regeneration rate and growth rate. However, it is unclear how the annual allowable cut/ harvest quota is determined, and no information was located regarding whether there is a minimum density for exploitation or minimum cutting cycle. It is also unclear how often inventory data within management plans must be updated (noting the previous extirpation of commercial stocks in some locations in the country) and how management is adapted accordingly. *D. melanoxylon* does not appear to be grown in plantations in Tanzania. The 2015 national inventory data estimated a large population (1.3 billion stems) with adequate recruitment potential of *D. melanoxylon* in Tanzania. However, further global decline of the species is projected based on current logging levels in the	**Unknown status**

Dalbergia melanoxylon (cont.)	United Republic of Tanzania (cont.)	country, and without clearer information on the methodology for setting annual harvest quotas and details of site monitoring, it is not possible to determine whether exports are subject to a robust non-detriment finding in line with the provisions of Article IV. Therefore, categorised as **Unknown status**. Tanzania could also be requested to investigate and clarify the reason for the large discrepancies between the export volumes reported by the CITES MA of Tanzania in their response to the RST consultation and export volumes reported in the CITES Trade Database.	
Dalbergia tucurensis	Overview	**Globally Endangered** (2019 assessment), based on an estimated 50% population decline over the past three generations. However, it is unclear if the species concept assessed is the same species concept recognised under the CITES standard nomenclature reference or by Nicaragua.	
	Nicaragua (Response received)	*D. tucurensis* occurs throughout Nicaragua but appears to be concentrated in the north of the country, in the provinces of Matagalpa, Jinotega, and the Autonomous Region of the Northern Caribbean Coast. No population estimates are available, however the species has been surveyed as part of Nicaragua's National Forest Inventory and two other large studies. On the basis of data available, Nicaragua did not consider the species to be threatened in the country. Nicaragua has submitted CITES annual reports for all years 2014-2022 and has not published any CITES export quotas for this species. Direct exports 2014-2022 predominantly comprised wild-sourced sawn wood for commercial purposes (8371 m^3 reported by Nicaragua and 1030 m^3 reported by importers); China additionally reported imports of 4173 m^3 of wild-sourced logs for commercial purposes. Nicaragua provided harvest volumes 2015-2022, which averaged 126.3 m^3 per year; these volumes appear insufficient to account for the exports reported (noting that no timber in trade over this period was reported as pre-Convention). Annual harvest quotas were reported to be calculated using a modified Von Mantel formula, but quotas for 2014-2022 were not provided. Harvest is only permitted with an approved management plan; the minimum cutting diameter is 40 cm, and the minimum cutting cycle is 15 years; however, these are general rather than species-specific parameters. Baseline inventory data show a favourable regeneration potential for the species, and harvest levels appear to be low. Non-detriment findings are made on the basis of management plans for authorized areas, for which the management conditions are regulated by law. However, management parameters are generic rather than species-specific, and no management plans for specific harvest areas were available. In addition, there is some doubt as to whether the species exported in trade is *D. tucurensis*. On this basis, classified as **Action is needed.** Referral to the nomenclature specialist is also recommended due to taxonomic uncertainties associated with the species concept.	**Action is needed**
Guibourtia tessmannii	Overview	**Globally Endangered** (2020 assessment), with a decreasing population trend, on the basis that the global population is predicted to decline by over 50% over the next 100 years as a result of overharvesting and loss of seed dispersers.	

Guibourtia tessmannii (cont.)	Cameroon (Response received)	Distributed throughout Cameroon but the largest stocks occur in the country's South and Littoral regions. No population estimates could be located, however inventory data 2003-2008 indicated an average density of 0.02 trees/ha (DBH ≥ 20 cm), lower than the widely reported average density for the species across its range of 0.05 trees/ha. Cameroon has submitted annual reports for fauna for 2017-2022, but not yet for flora. All trade in *G. tessmannii* has therefore been reported by importers only: direct exports from Cameroon 2017-2022 mostly comprised 6177 m^3 sawn wood and 451 m^3 logs wild-sourced for commercial purposes, with the remainder of trade in pre-Convention commodities. Cameroon has published genus-level CITES export quotas for *Guibourtia* spp. 2019-2023. Based on importer-reported data, direct exports of wild-sourced logs and sawn wood from all *Guibourtia* spp. appear to have exceeded the quota published for 2020. Cameroon indicated that *G. tessmannii* is managed collectively with *G. pellegriniana* under the tradename 'pink bubinga'; both species are considered extremely difficult to distinguish in the field. Logging of pink bubinga is permitted only in forest management units (FMUs) and council forests, for which detailed management plans are required; these require a minimum logging cycle of 30 years. Cameroon was reported to require that concessions adopt management parameters that guarantee that 50% of the volume harvested will have been replaced by the start of the next logging cycle (i.e. a 50% recovery rate). Some sources report there to be a minimum density for harvest of 0.05 trees/ha, but it is unclear whether this is enforced. The minimum exploitable diameter (MED) for the species was reported to be 80 cm, although due to the rarity of the species, an MED of 110 cm was being considered. The export of *G. tessmannii* logs has been prohibited since 2018. Cameroon estimated that between 2017-2021, there was a harvest potential of 13 994 m^3 for *G. tessmannii*, for which a harvest quota of 50% was authorised; however, this volume of harvest does not appear to align with export volumes of *G. tessmannii* from Cameroon reported by the Management Authority, which exceeded 22 000 m^3 2017-2021. A conversion rate of 40% was reported to be applied to the harvest volume to calculate the export quota for sawn wood, however information provided by the CITES SA of Cameroon also appeared to imply that conversion rates are calculated on a sawmill-by-sawmill basis. Cameroon have set some of the key management parameters needed to underpin a non-detriment finding, including a minimum exploitable diameter, stem density, and recovery rate. However, there is a lack of detail regarding how harvestable volumes are calculated by the Scientific Authority, and it is unclear whether the minimum stem density requirement is enforced and sustainable. Furthermore, it is unclear whether the target of adopting management parameters that guarantee only a 50% recovery rate is sustainable in the long term. On this basis, categorised as **Action is needed**. Between 2019-2021 Cameroon published quotas for *Guibourtia* spp. for logs and sawn wood, despite a prohibition on the export of *G. tessmannii* logs in place since 2018. It may be relevant to consider whether genus-level quotas are appropriate in cases where species in the genus are subject to individual restrictions. Quotas for 2022-2023 were additionally not associated with a clear term code; in future, Cameroon could be requested to specify the term codes its CITES export quotas apply to, and to make them species-specific in order to clarify their scope.	**Action is needed**

Guibourtia tessmannii (cont.)	Cameroon (cont.)	Non-submission of annual reports for flora is a concern identified that is unrelated to the implementation of Article IV; it may be relevant to consider referral of Cameroon to the Standing Committee on this matter, noting that this issue was previously discussed at SC74.	
	Equatorial Guinea (Response received)	Distributed throughout Equatorial Guinea, with the average population density estimated at 0.077 trees/ha and a national population size estimated at 102 795 trees (DBH ≥ 110 cm), based on results from Equatorial Guinea's national forest inventory (sample size n = 10 trees of DBH ≥110 cm in 130 plots of 1ha). Equatorial Guinea has submitted annual reports for all years 2017-2022. Direct exports 2017-2022 according to Equatorial Guinea comprised 5205 m^3 of wild-sourced timber; importers reported the export of 12 123 m^3 of wild-sourced logs and 36 552 m^3 of wild-sourced sawn wood over the same period. Equatorial Guinea published its first export quota for *G. tessmannii* in 2023, for 3000 m^3 'wild'. Harvest of *G. tessmannii* required special ministerial authorization, and export of the species in roundwood or sawn form was entirely prohibited under Equatorial Guinea's national legislation from 1997-2020; this prohibition was lifted in late 2020, when the harvest and export of *G. tessmannii* by the State was authorised by Decree. According to importer-reported data in the CITES Trade Database, exports of wild-sourced *G. tessmannii* appear to have occurred during the national ban. While management plans are a legal requirement for companies logging in forest concessions, concerns have been raised that these plans do not contain detailed information and are not effectively implemented on the ground. The minimum exploitable diameter (MED) for the species appears to be 70 cm. No information was found regarding a minimum recovery rate, minimum density for exploitation, or the parameters used to determine an annual quota for exploitation of the species. The basis for the non-detriment findings for export of wild *G. tessmannii*, as well as the technical basis for the new export quota for 2023 (3000 m^3), is unknown; therefore categorised as **Action is needed**. No term was specified for Equatorial Guinea's 2023 quota; in future, the country could be requested to specify the relevant term code(s) in published quotas in order to clarify their scope.	**Action is needed**
		SANTANALES	
		SANTALACEAE	
Osyris lanceolata	Overview	**Globally Least Concern** (2017 assessment), with an unknown population trend, on the basis that the global population is assumed to be large and relatively stable.	
	Burundi (Response received)	*O. lanceolata* has been recorded in the north and east of the country, although it may occur more widely. The population size and conservation status of the species in Burundi is unknown and no comprehensive inventory has taken place. However, the population was considered to have considerably declined as a result of excessive harvest driven by international demand for sandalwood oil. The species has reportedly been fully protected in the country since 2011, although exports have occurred after this date and the species continues to be illegally harvested, including from within protected areas.	**Action is needed**

Osyris lanceolata (cont.)	Burundi (cont.)	Burundi has submitted all annual reports to CITES for the period 2013-2022 except for 2018 and 2022, and has not published any CITE export quotas for the species. All direct trade in *O. lanceolata* from Burundi was wild-sourced for commercial purposes and reported in 2015-2017. This trade totalled 102 750 kg of chips and 3500 kg of oil as reported by Burundi, and 300 kg of oil as reported by importers. No trade has been reported since 2017. Given a lack of population and monitoring data but a presumed declining population, it is unlikely that Burundi would be able to produce a scientifically robust non-detriment finding for continued trade in *O. lanceolata.* It is unclear if Burundi intends to continue to export the species, but the country noted a need for capacity building to complete a non-detriment finding, therefore categorised as **Action is needed**.	
	Ethiopia (No response received)	*O. lanceolata* was described as occurring in most Ethiopian regions, but the population size and conservation status of the species in Ethiopia is unknown. Data on stem density and basal area distribution, and an analysis of the proportion for seedlings to saplings to mature trees, were available from only two sites in southern Ethiopia; these were considered to show some evidence of high regeneration but poor recruitment. The areas in which the species was most abundant were all protected, suggesting that harvesting may be having an impact outside of protected areas. The country was noted to possess an industry for essential oil extraction and processing. No information could be located on volumes of *O. lanceolata* processed, or whether the industry primarily deals with *O. lanceolata* harvested from Ethiopia or from other countries. Ethiopia has submitted annual reports for all years 2013-2022 with the exception of 2013, and has not published any CITES export quotas for the species. No direct trade in *O. lanceolata* was reported from Ethiopia until 2022, when 1600 kg of wild-sourced oil was exported to India for commercial purposes, as reported by Ethiopia only. An approved management plan is required to exploit productive state or protected forests, but no information could be located regarding whether there are requirements for parameters such as minimum cutting diameters, cutting cycles, or recovery rates. There are large information gaps regarding the status of the species and its management in Ethiopia, and it is unclear how a scientifically robust non-detriment finding for trade in *O. lanceolata* in accordance with Article IV has been made, therefore classified as **Action is needed**.	**Action is needed**
	Uganda (Response received)	*O. lanceolata* largely occurs in eastern Uganda, with Karamoja sub-region holding the largest populations. The species is thought to have undergone a general decline in the country as a result of overexploitation for export; a 2021 inventory conducted in five eastern Ugandan districts found the standing stock of *O. lanceolata,* as well as levels of recruitment and regeneration, to be too low to sustain commercial production of raw material for sandalwood oil. The authors of the inventory recommended that commercial harvesting of *O. lanceolata* should not take place for another 20 years, to allow for the recovery of Ugandan populations. Uganda has submitted annual reports for all years 2013-2022, and has not published any CITES export quotas for the species. Direct trade in *O. lanceolata* from Uganda 2013-2022 principally comprised wild-sourced powder (16 500 kg) and	**Conditional upon annual publication of a zero export quota, Less concern**

Osyris lanceolata (cont.)	Uganda (cont.)	oil (752 kg) as reported by Uganda, and traded for commercial purposes. Direct exports of 300 kg of wild-sourced timber and 25 kg of wild-sourced extract were reported by importers only. Uganda reported that the harvest, trade and export of *O. lanceolata* is prohibited; the re-export of processed products manufactured with raw material from neighbouring countries is, however, permitted. It is unclear how long such a harvest ban has been in place or whether there is an exception for non-commercial use. On the basis that no legal export of wild specimens is anticipated, and conditional upon the annual publication of a zero quota on the CITES website, classified as **Less concern**. Any planned changes to the zero quota should be communicated to the Secretariat and Chair of the Plants Committee for their agreement, along with a justification demonstrating how the change is based on estimates of sustainable offtake using the best available scientific information, for their agreement. Illegal trade remains a concern not related to the implementation of Article IV, with the potential to impact wild populations of *O. lanceolata* in both Uganda and neighbouring countries; a regional approach to address illegal activity appears to be needed.	
	United Republic of Tanzania (Response received)	*O. lanceolata* is widespread throughout the United Republic of Tanzania (hereafter Tanzania). The species was heavily exploited in the 1990s and early 2000s, but harvest was banned in 2006 to curb declines, with restrictions on trade reportedly being imposed as early as 1993. Tanzania has submitted annual reports for all years 2013-2022 with the exception of 2021, and has not published any CITES export quotas for the species. Despite the prohibition of *O. lanceolata* harvest, direct exports 2013-2022 as reported by Tanzania included 26 790 kg of wild-sourced oil, 24 001 kg of wild-sourced powder, and 525 kg of wild-sourced sawn wood, all for commercial purposes. Importers reported direct trade in wild-sourced powder (24 000 kg), timber (17 500 kg) and oil (1215 kg) for commercial purposes. Tanzania has stated that there is no trade in *O. lanceolata* that is harvested in Tanzanian forests, implying that the reported trade was actually re-exports. In July 2022 Tanzania published a non-detriment finding for *O. lanceolata,* which concluded that there was insufficient quantitative information on the species to justify legal harvest. Although inventories conducted in three areas found the species to be recovering, all individuals surveyed were considered juveniles that had not reached the minimum harvest size. Concerns about ongoing illegal harvest have been raised, although recent studies found no evidence of illegal harvest in parts of the country. Tanzania has 3-4 processing factories for sandalwood, which were reported to source their raw materials mainly from Uganda, Democratic Republic of the Congo, South Sudan and Australia, and which were reported to have exported thousands of kg of sandalwood oil since 2016. Because export data from these factories only indicates that the exports comprise 'sandalwood' it is unclear whether any of these re-export *O. lanceolata*. On the basis that harvest and export have been prohibited to allow regeneration of the species, and conditional upon the annual publication of a zero quota on the CITES website, classified as **Less concern**. Any planned changes to the zero quota should be communicated to the Secretariat and Chair of the Plants Committee along with a justification on how the change is based on estimates of sustainable offtake using the best available scientific information, for their	**Conditional upon annual publication of a zero export quota, Less concern**

Osyris lanceolata (cont.)	United Republic of Tanzania (cont.)	agreement. Tanzania are encouraged to improve national reporting for trade in the species, ensuring that any future re-exports are correctly identified.	
		MYRTALES	
		THYMELEAECEAE	
Aquilaria crassna	Overview	**Globally Critically Endangered** (2017 assessment), with a decreasing population trend, based on an estimated population decline of over 80% over the last three generations (~150 years).	
	Viet Nam (No response received)	Reported to be widespread in central and southern Viet Nam, however the wild population is considered to have dramatically declined, with one study estimating a decrease from > 10 000 individuals before 1970 to near extinction in 2005. No more recent descriptions of population status in the wild could be located. Viet Nam has submitted all annual reports to CITES for the period 2013-2022 except for 2022, which had not been received at the time of writing. Viet Nam has not published any CITES export quotas for this species. Direct trade in *A. crassna* from Viet Nam 2013-2022 principally comprised high volumes of artificially propagated chips, derivatives, extract, live plants, powder, and wood products traded for commercial purposes. Wild-sourced trade was reported by importers only (with the exception of 0.01 litres of oil reported by Viet Nam for scientific purposes), and predominantly comprised 9980 kg of chips and 2188 kg of derivatives. Permit analysis suggests that all trade reported by importers as wild-sourced through 2021 was reported as artificially propagated by Viet Nam; comparison of trade reported for 2022 was not yet feasible. Viet Nam's national legislation reportedly only allows the export of *A. crassna* agarwood grown and sourced from plantations, and trade in wild-sourced *A. crassna* is prohibited. Plantations of *A. crassna* in Viet Nam were reported to cover ~ 16 000-30 000 ha, with "millions" of individuals occurring in home gardens. A formal registration system is in place for plantation agarwood, requiring all companies or households operating *A. crassna* plantations to be registered with the Forest Department, which is in charge of the enforcement of local regulations and the provision of seeds for home gardens. Given that harvest and export of wild specimens is reported to be illegal, and that Viet Nam has not reported any commercial exports of wild-sourced specimens, the provisions of Article IV are not applicable; therefore, categorised as **Less concern**. However, illegal trade and export of timber has an impact on the survival of the species in the wild, and remains a concern not related to the implementation of Article IV. It may therefore be relevant to consider requesting Viet Nam to publish a zero-export quota for wild specimens. Possible misreporting of artificially propagated exports by importers as wild-sourced trade could also be queried.	**Less concern**
Aquilaria malaccensis	Overview	Globally Critically Endangered (2018 assessment), with a decreasing population trend, on the basis of an estimated population decline over the last three generations (150-300 years) of over 80%.	

Aquilaria malaccensis (cont.)	Indonesia (Response received)	*A. malaccensis* is found in western Indonesia, principally in Kalimantan and Sumatra. The species has been reported to occur at densities of 0.01-0.8 individuals/ha in the wild. An inventory of wild agarwood tree species populations has not been conducted, but populations in Indonesia were considered to be decreasing as a result of overexploitation, forest loss and land use change; the rate of decline is unknown. Indonesia has submitted CITES annual reports for all years 2013-2022 and published export quotas for wild specimens of the genus *Aquilaria* 2013-2016 and for the species *A. malaccensis* 2017-2022. Recent species-level quotas for 2022 and 2023 were 10% and 5% lower than the 2021 quota, respectively. Genus-level export quotas appear to have been exceeded in 2013-2016 (as reported by Indonesia and exporters) as do the species-level quotas in 2021 (as reported by Indonesia and exporters) and 2022 (according to Indonesia only). As reported by Indonesia, direct trade in *A. malaccensis* 2013-2022 principally comprised high volumes of wild-sourced chips (1.07 million kg), powder (53 728 kg), logs (49 644 kg), and timber (16 172 kg) traded for commercial purposes. Importers reported wild-sourced trade mostly consisting of 751 925 kg of chips, 74 491 kg of powder, and 38 243 kg of logs. Agarwood is treated as a non-timber forest product. Annual harvest and export quotas were reported to be determined for individual provinces based on standing stocks across “all types of population” (wild, assisted production and plantation); these therefore appear to be combined quotas that cover all production systems, but the situation requires further clarification. The exact methodology for setting quotas was not provided. Indonesia confirmed that agarwood from registered plantations is not subject to a quota, but also noted that not all owners of agarwood plantations have registered them; it is assumed that products from non-registered plantations are allocated source code W. Quotas for *A. malaccensis* were reported to have been lowered to encourage registration of stocks in plantations. Indonesia further stated that they are committed to decreasing the harvest quota for “wild” *A. malaccensis* by 40% in 2024, although the baseline year for the 40% reduction is unclear, and as noted above it is unclear whether individual quotas are set for different production systems. Approximately 3.4 million *A. malaccensis* trees are growing in home gardens and plantations, the majority of which are located in Sumatra and Kalimantan. Indonesia referred to “assisted production” of the species in their response, but the use of source code Y does not appear to have been considered to date. The information provided suggests that the quota for wild specimens includes other production systems (plantations and assisted production). It seems likely that a large proportion of reported trade is in specimens from non-wild sources, and it is therefore difficult to assess the impact of wild-sourced trade on populations. Given the Critically Endangered status of the species, the decreasing population trend in Indonesia, the lack of a robust non-detriment finding, and the absence of a clear quota setting process for wild-sourced trade, categorised as **Action is needed.** Setting separate quotas for wild specimens and other production systems (sources A and Y), and ensuring that all quotas specify the terms that are exported from the country (e.g. chips, powder), seems a key requirement to monitor trade;	**Action is needed**

Aquilaria malaccensis (cont.)	Indonesia (cont.)	Indonesia could therefore be requested to clarify the scope of the current quota, and in future, to consider setting term- and production system-specific quotas as outlined above.	
	Malaysia (Response received)	*A. malaccensis* is found in Peninsular Malaysia and Sabah, but its occurrence in Sarawak is unclear. A census of wild agarwood tree species populations has been conducted in Peninsular Malaysia only, however no numerical estimates of stems/ha could be located. In this region, the species is found in primary and logged forests, with populations in decline due to over exploitation and, to a lesser extent, habitat loss. No information on the status of the populations in Sabah and Sarawak could be located. Illegal trade was reported to be a country-wide problem, including within protected areas. Malaysia has submitted CITES annual reports for all years 2013-2021 but the report for 2022 has not yet been received. Malaysia published export quotas at the genus level for all years 2013-2023; direct exports did not appear to exceed any quota as reported by Malaysia and importers. Direct exports of *A. malaccensis* were mainly reported by importers and consisted predominantly of wild-sourced chips, powder, and timber traded for commercial purposes. Permit analysis indicated that Malaysia largely reported the same trade at the genus level, with the highest exporter-reported quantities in wild-sourced chips (720 194 kg) and powder (166 809 kg). Malaysia is in the process of implementing a conservation action plan for the species. Quotas were reported to be based on information on the standing stock of populations > 30cm diameter, but the exact methodology was not provided. Quotas have been lowered since 2021 to move towards a zero export quota for the *Aquilaria* spp., in order to “stabilize the wild population of the species”. No permits to harvest specimens from the wild from Forest Reserves were reported to have been issued since 2015; exports of wild specimens since 2015 relate only to stockpiles. A large number of *Aquilaria* trees (at last a million) occur in plantations in Malaysia, but the use of source code Y does not appear to have been considered to date. Malaysia has made efforts to reduce harvest and trade of wild specimens and has not allowed harvest from Forest Reserves since 2015. However, a high level of trade has been reported since 2015 (all reportedly from stockpiles), and it is not clear if any reported wild-sourced exports have come from assisted production (source code Y). Given the Critically Endangered status of the species, the decreasing population trend in Peninsular Malaysia, and the lack of a robust non-detriment finding and clear quota setting process, categorised as **Action is needed**. Malaysia has predominantly published genus-level export quotas for wild-sourced *Aquilaria* spp. in all years 2013-2023, and reported trade predominantly at the genus level over this period. To improve monitoring of trade in *A. malaccensis*, Malaysia could be requested to publish species-, term- and production system-specific quotas, and report trade at the species level.	Action is needed
Gyrinops spp.	Overview	Nine species of *Gyrinops* are recognised by Kew’s Plants of the World Online, of which seven occur in Indonesia and Papua New Guinea: *G. caudata* (Vulnerable, 2021 assessment) *G. decipiens* (provisionally assessed as Endangered)	

Gyrinops spp. (cont.)	Overview (cont.)	*G. ledermanii* (Endangered, 2020 assessment) *G. moluccana* (provisionally assessed as Endangered) *G. podocarpus* (provisionally assessed as Endangered) *G. salicifolia* (Endangered, 2021 assessment) *G. versteegii* (provisionally assessed as Endangered)	
	Indonesia (Response received)	Seven *Gyrinops* species occur in Indonesia, with *G. versteegii* being the most widely distributed species. Although a full census of wild agarwood species has not been conducted, the genus is reported to generally occur at low densities (2 trees/ha), and populations of *G. caudata, G. ledermanii, G. salicifolia* and *G. versteegii* are suspected to be decreasing globally because of overexploitation. Surveys of *G. versteegii* conducted at a limited number of sites in Indonesia suggest that few mature trees remain; this has consistently been attributed to overexploitation. Indonesia has submitted CITES annual reports for all years 2013-2022 and published quotas at both genus-level (*Gyrinops* spp. 2013-2016 and 2021-2023) and species-level (*G. versteegii* 2017-2022 and *G. decipiens* in 2020 only). Quotas at the genus level appear to have been exceeded according to Indonesia and importers in 2021-2022, and those for *G. versteegii* appear to have been exceeded in 2020-2021 as reported by Indonesia and 2020-2022 as reported by importers. Additional information in the remarks of Indonesia’s annual reports suggest that the quota for 2021 may not have been exceeded, and that the 2022 quota excess could be reduced. Direct trade in all *Gyrinops* spp. from Indonesia 2013-2022 largely comprised high volumes of wild-sourced chips (334 146 kg) and powder (887 061 kg) traded for commercial purposes as reported by Indonesia. The only trade reported at the species level was for *G. versteegii*, predominantly as 132 618 kg of wild-sourced chips reported by Indonesia. Agarwood in Indonesia is treated as a non-timber forest product, with harvest and export quotas set at the provincial level. All trade in *Gyrinops* spp. since 2020 was reported to be derived from “decaying logs”, with no trade in specimens originating from living trees. Quotas are established to control distribution of extraction and minimise disturbance to swamp. They are set for domestic and international trade in decaying logs and are based on the estimated potential yield from the total area of known swamps containing decaying logs (the Mappi and Asmat Regencies of South Papua province), but the exact methodology was not provided by Indonesia. Given that Indonesia only exports derivatives from decaying logs of dead trees and not from living stands, the impact of trade on wild populations is likely to be non-detrimental. The case could therefore be categorised as **Less concern**, provided that Indonesia agrees to specify that export quotas for *Gyrinops* spp. relate to derivatives of decaying logs from the Mappi and Asmat Regencies, and agrees to publish an annual zero export quota for any other wild harvest. In addition, where possible, Indonesia could be requested to submit quotas that relate to the products exported (e.g. powder, chips). Clarification on the apparent quota excesses in 2021-2022 could also be requested.	**Less concern, provided that Indonesia agrees to specify that export quotas for *Gyrinops* spp. relate to derivatives of decaying logs from the Mappi and Asmat Regencies, and agrees to publish an annual zero export quota for any other wild harvest**
	Papua New Guinea (Response received)	The number of *Gyrinops* species occurring in Papua New Guinea (hereafter PNG) is uncertain but includes at least two species (*G. caudata* and *G. ledermanii*). PNG confirmed that no information on the population size, status or trends of *Gyrinops* spp. in the country is available. However, *G. ledermanii* is thought to be the most widely distributed species in PNG, and is	**Action is needed**

Gyrinops spp. (cont.)	Papua New Guinea (cont.)	estimated to have undergone a 30% decline globally over the past three generations (90-150 years) as a result of commercial exploitation, driven by international demand for agarwood. PNG has submitted annual reports to CITES for all years 2013-2022 with the exception of 2021, and has not published CITES export quotas for this genus. Direct trade in *Gyrinops* spp. from PNG was largely composed of wild-sourced chips (21 545 kg as reported by Papua New Guinea) and timber (8781 kg reported by importers only). A management plan for natural agarwood resources was produced in 2011, which describes how the harvest of agarwood-producing trees should be conducted and regulated. However, PNG confirmed that no information was available on current harvest levels in the country, despite the existence of provisions relating to inventories and monitoring within the plan. Additionally, no information could be identified on the extent to which the harvest management practices and compliance monitoring procedures stipulated by the plan have been implemented. Given the lack of recent information on the population status and harvest impacts on *Gyrinops* species in the country, as well as a lack of clarity regarding whether harvest management practices and compliance monitoring procedures are implemented, the basis for a robust non-detriment finding is not clear; therefore categorised as **Action is needed.**

Introduction

The Review of Significant Trade (hereafter abbreviated to RST) was established to ensure that international trade of species listed in Appendix II of CITES is sustainable and does not threaten their survival. It does so by examining whether the provisions of Article IV of the Convention, specifically paragraphs 2 (a), 3 and 6 (3) relating to non-detriment findings, are being properly applied to Appendix II species.

The RST has multiple stages, which are set out in Resolution Conf. 12.8 (Rev. CoP18). As part of Stage 1 of the process, at PC26 the Plants Committee identified 28 species/country combinations and one genus/country combination for inclusion in Stage 2 of the RST (PC26 Sum. 4 (Rev.1)). This stage focuses on consultation with the relevant selected range States and compilation of relevant information. Paragraph 1 (d) ii) specifically directs the Secretariat to compile, or appoint consultants to compile, a report about the biology and management of trade in these species, including any relevant information from the range State. As such, the UN Environment World Conservation Monitoring Centre (UNEP-WCMC) was asked by the CITES Secretariat to compile reviews for the 14 plant species or genus/country combinations shown in Table i.

This report provides an overview of conservation and trade status of those taxon/country combinations for review by the Plants Committee, provisionally classifying each into one of three categories as defined in paragraph 1 (e) of Resolution Conf. 12.8 (Rev. CoP18):

- **Action is needed**: taxon/country combinations for which the available information suggests that the provisions of Article IV, paragraph 2 (a), 3 or 6 (a), are not being implemented;
- **Unknown status**: taxon/country combinations for which the Secretariat (or consultants) could not determine whether or not these provisions are being implemented; and
- **Less concern**: taxon/country combinations for which the available information appears to indicate that these provisions are being met.

The provisional categories assigned for the 14 combinations assessed can be found in Table ii.

Methodology

Each taxon/country review provides the following information: history of the CITES RST process for the taxon; taxon biology and current distribution; conservation status, population trends and threats; recent trade; management of the taxon in each range State, including any relevant legislation; and issues identified that are not related to the implementation of Article IV, paragraphs 2(a), 3 or 6(a). The national legislation category as defined under the CITES National Legislation Project is based on the most recent update available (November 2023) at the time of writing (April 2024). Where there are multiple range States reviewed for a particular taxon, an overview of global distribution, conservation status, threats, trade, and management is also provided. Where possible, literature was reviewed by a native speaker of the language it was written in; machine translations were used when this was not possible.

CITES trade data are provided for the period 2013-2022. Data were downloaded from the CITES Trade Database (trade.cites.org) on 11 April 2024[1]. Unless otherwise specified, trade tables include all

[1] This includes data from all annual reports and query replies received by UNEP-WCMC by 14 January 2024.

sources, terms and units reported in trade. The unit 'number of specimens' includes trade data reported with unit code 'NAR' or where the unit column is blank. Trade volumes are provided as reported by both exporters and importers, and direct trade and indirect trade (re-exports originating from the range State under review) are reported separately. A list of CITES annual reports received from each range State included in the process, along with the date each became a Party to CITES, is provided in Table iii.

CITES Management Authorities for each range State were contacted both by the Secretariat and by UNEP-WCMC, and asked to provide information relevant to the formation of non-detriment findings, including information on the distribution, conservation status, trade and management of each taxon. Where possible, national experts were also contacted to provide additional country-specific information. Responses were received from all range States (Burundi, Cameroon, Equatorial Guinea, Indonesia, Malaysia, Nicaragua, Papua New Guinea, Uganda, and the United Republic of Tanzania) except for Ethiopia, Mozambique, and Viet Nam, who had not responded to the consultation by the time of report submission (April 2024). A compilation of range State responses is provided in PC27 Doc. 15.4 Annex 1.

Table iii: Overview of annual report submissions by range States under review, 2013-2022.

Country	Date of joining CITES	Entry into force of CITES	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Burundi	08/08/1988	06/11/1988	✓	✓	✓	✓	✓	✕	✓	✓	✓	✕
Cameroon	05/06/1981	03/09/1981	✓	✓	✓	✓	✓*	✓*	✓*	✓*	✓*	✓
Equatorial Guinea	10/03/1992	08/06/1992	✕	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ethiopia	05/04/1989	04/07/1989	✕	✓	✓	✓	✓	✓	✓	✓	✓	✓
Indonesia	28/12/1978	28/03/1979	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Malaysia	20/10/1977	18/01/1978	✓	✓	✓	✓	✓	✓	✓	✓	✓	✕
Mozambique	25/03/1981	23/06/1981	✓	✓	✓	✓	✓	✓	✓	✓	✓	✕
Nicaragua	06/08/1977	04/11/1977	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Papua New Guinea	12/12/1975	11/03/1976	✓	✓	✓	✓	✓	✓	✓	✓	✕	✓
Uganda	18/07/1991	16/10/1991	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
United Republic of Tanzania	29/11/1979	27/02/1980	✓	✓	✓	✓	✓	✓	✓	✓	✕	✓
Viet Nam	20/01/1994	20/04/1994	✓	✓	✓	✓	✓	✕	✓	✓	✓	✕

Key: ✓: annual report received. ✕: annual report not received.
*Fauna only

Taxon reviews

Dalbergia melanoxylon: Mozambique, United Republic of Tanzania

A. Summary

CRITERIA MET:

Criterion i) trade in an endangered species and criterion v) high volume of trade in a globally threatened species.

GLOBAL STATUS:

Globally Near Threatened (2020 assessment), with a decreasing population trend, based on a suspected population decline of 20-30% over the last three generations (150 years); an additional decline of 20-30% by 2120 was projected based on significant ongoing logging in Mozambique and the United Republic of Tanzania.

MOZAMBIQUE:

No response received to the consultation relating to the RST

D. melanoxylon is widely distributed throughout Mozambique but is most abundant in the north, notably within Cabo Delgado province, where the only commercial stands remain. No national inventory data were located for the species, but a 2015 study reported a density of one tree/ha in central Mozambique. A 2015-2017 multi-species forest inventory found national forest stocks overall to have a reverse J-shaped size class distribution, suggesting adequate potential for recruitment, but species-specific information is lacking and the recruitment status of *D. melanoxylon* is unknown.

D. melanoxylon is a valuable and important commercial species. Past overharvest for the international musical instrument industry has led to commercial extirpation in some areas of Mozambique, and legal and illegal export for the Chinese hongmu furniture market is reportedly significant and increasing. Illegal logging appears to account for a substantial proportion of total national forestry, with estimates ranging from 50% to 93%. The species' miombo woodland habitat is also subject to degradation and clearance for agriculture.

Mozambique has submitted all annual reports to CITES for the period 2017-2021; the 2022 report had not yet been received at the time of writing. Mozambique has not published any CITES export quotas for this species. Direct trade 2017-2022 principally comprised wild-sourced timber for commercial purposes, amounting to 879 264 kg, 79 821 m^3, and 3.91 million pieces according to Mozambique. While Mozambique reported trade almost entirely as timber, importers reported wild-sourced logs (28 369 m^3) and sawn wood (11 075 m^3).

The 2016 national havest quota for the species was set at 1845 tonnes, and a total annual allowable cut (AAC) for the period 2015-2017 was set at 20 040 m$^{3;}$ however more recent figures could not be located, and it is unclear how harvest quotas and the annual allowable cut relate to each other. A minimum exploitable diameter of 20 cm DBH is in place, however no information was located regarding a minimum recovery rate, minimum density for exploitation, or the parameters used to set the felling quota or AAC. *D. melanoxylon* does not appear to be grown in plantations in Mozambique.

PROVISIONAL CATEGORY:	The population size and regeneration status of *D. melanoxylon* in Mozambique are unknown, but commercial stands are reported to only remain in one province. Mozambique is the source of the majority of *D. melanoxylon* exported for the hongmu market, and international demand for the species from the musical instrument market appears to remain significant. The basis for non-detriment findings for export of *D. melanoxylon* are unclear, therefore categorised as **Action is needed.** Illegal harvest and timber smuggling appear substantial in the national forest sector representing a concern not related to the implementation of Article IV.
UNITED REPUBLIC OF TANZANIA: Responded to the consultation relating to the RST	*D. melanoxylon* occurs most frequently in miombo woodland, which is distributed throughout the south, west and southeast of the United Republic of Tanzania (hereafter Tanzania). The largest stands were reported from the southeast where commercial harvest is concentrated; extirpation of commercially valuable stems in the Rufiji district in the east was reported as a result of overharvest. The country's 2015 national forest inventory estimated a total population size of 1.3 billion *D. melanoxylon* stems, corresponding to a timber volume of 22.9 million m^3. Size class distributions at the time of the survey represented a reverse J-shaped curve, indicating high potential for recruitment (which is usually suggestive of low trade impact). A second national forest inventory is planned, although the timetable for completion is unknown. A survey conducted in 2017 in southeast Tanzania reported population densities of 32-57 *D. melanoxylon* trees/ha, and occurrence of large trees >50 cm diameter at breast height (DBH). Although Tanzania did not report any serious threats to *D. melanoxylon* and noted that the species is not illegally logged, multiple sources have raised concerns regarding overharvest; the IUCN Red List assessment, for example, forecast that continued high demand could lead to the commercial exhaustion of national stocks in future. Miombo woodland in the country is also subject to forest conversion for agriculture and degradation from wildfires. Tanzania has submitted all annual reports to CITES for the period 2017-2022 except for 2021, and has not published any CITES export quotas for this species. Direct exports 2017-2022 principally comprised wild-sourced sawn wood (reported as 72 762 kg, 578 m^3, and 8700 units) and timber (44 400 kg) traded for commercial purposes as reported by Tanzania. Direct trade as reported by importers mostly consisted of 223 941 wood products and 107 080 kg of sawn wood. Non-detriment findings (NDFs) appear to be made at the level of individual forest management units. A minimum exploitable diameter has been set at 24 cm DBH, and exports are only permitted from sites with management plans that include information on population size and structure, regeneration rate and growth rate. However, it is unclear how the annual allowable cut/ harvest quota is determined, and no information was located regarding whether there is a minimum density for exploitation or minimum cutting cycle. It is also unclear how often inventory data within management plans must be updated (noting the previous extirpation of commercial stocks in some locations in the country) and how management is adapted accordingly. *D. melanoxylon* does not appear to be grown in plantations in Tanzania.

PROVISIONAL CATEGORY:	The 2015 national inventory data estimated a large population (1.3 billion stems) with adequate recruitment potential of *D. melanoxylon* in Tanzania. However, further global decline of the species is projected based on current logging levels in the country, and without clearer information on the methodology for setting annual harvest quotas and details of site monitoring, it is not possible to determine whether exports are subject to a robust non-detriment finding in line with the provisions of Article IV. Therefore, categorised as **Unknown status**. Tanzania could also be requested to investigate and clarify the reason for the large discrepancies between the export volumes reported by the CITES MA of Tanzania in their response to the RST consultation and export volumes reported in the CITES Trade Database.

B. RST background

PC26 marked the first time that *Dalbergia melanoxylon* has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Biology: *D. melanoxylon* is a small, multi-stemmed and heavily branched tree or shrub (Gregory *et al.*, 1999; Jenkins *et al.*, 2002; Lemmens, 2008). Mature trees typically attain heights of c. 4-8 m (Jenkins *et al.*, 2002; Malimbwi *et al.*, 2000), with estimates of maximum height ranging from 15 m (Malimbwi *et al.*, 2000) to 20 m (Jenkins *et al.*, 2002). *D. melanoxylon* is slow growing, taking 70-80 years to reach a "harvestable diameter" in intensively managed plantations, and up to 100 years in the wild (Winfield *et al.*, 2016). Hines & Eckman (1993) reported annual growth of 0.6-0.7 m in height and 1-1.5 cm in diameter for "well-tended" trees. Mature trees reach an average diameter at breast height (DBH) of 38-40 cm (Malimbwi *et al.*, 2000) but very old trees of 1 m DBH have been recorded (Jenkins *et al.* 2002).

D. melanoxylon is deciduous (Lemmens, 2008) and hermaphroditic (Washa, 2021), with bee-pollinated flowers (Orwa *et al.*, 2009) and wind-dispersed seeds (Gregory *et al.*, 1999). Trees produce seed annually (Lemmens, 2008). The species regenerates from seed as well as vegetatively from suckers (root stock) and coppice shoots (Jenkins *et al.*, 2012; Lemmens, 2008), although mature trees are less able to regenerate via coppicing (CABI, 2019). Accounts of the species' natural regeneration capacity vary; Msanga (1998 in Amri *et al.* 2009) noted reproductive limitations including poor germination capacity, and Washa & Nyomora (2012) observed "low" germination and seedling survival in the wild. Lemmens (2008) reported that regeneration is typically unsuccessful in closed canopy forest, but both seedling and vegetative regeneration are "often plentiful" following managed clearance in areas where *D. melanoxylon* is common.

D. melanoxylon tolerates a broad range of habitat types, including mixed deciduous forest and tropical dry forest, although it is most characteristic of open savanna "miombo" woodland (Barstow, 2020; Gregory *et al.*, 1999; Orwa *et al.*, 2009). The species occurs at altitudes of 0-1700 m above sea level (Cowell *et al.*, 2022), and tolerates a range of soil types including loamy sand and clayey vertisol (Jenkins *et al.*, 2002). *D. melanoxylon* requires significant moisture, and growth appears most successful in areas of 700-1200 mm mean annual rainfall (Jenkins *et al.*, 2002). Although mature trees are fire-tolerant (Gregory *et al.*, 1999; Hines & Eckman, 1993), seedlings and saplings are fire-sensitive and frequent fires "considerably reduce" regeneration (Lemmens, 2008).

Distribution: *D. melanoxylon* is widely distributed throughout sub-Saharan Africa (Barstow, 2020; Jenkins *et al.*, 2002) (Figure 1.1). It has an estimated extent of occurrence of >18 million km^2 and an area of occupancy of 2428 km^2; however, the latter is considered an underestimate that would likely at least double with increased collection effort (Barstow, 2020).

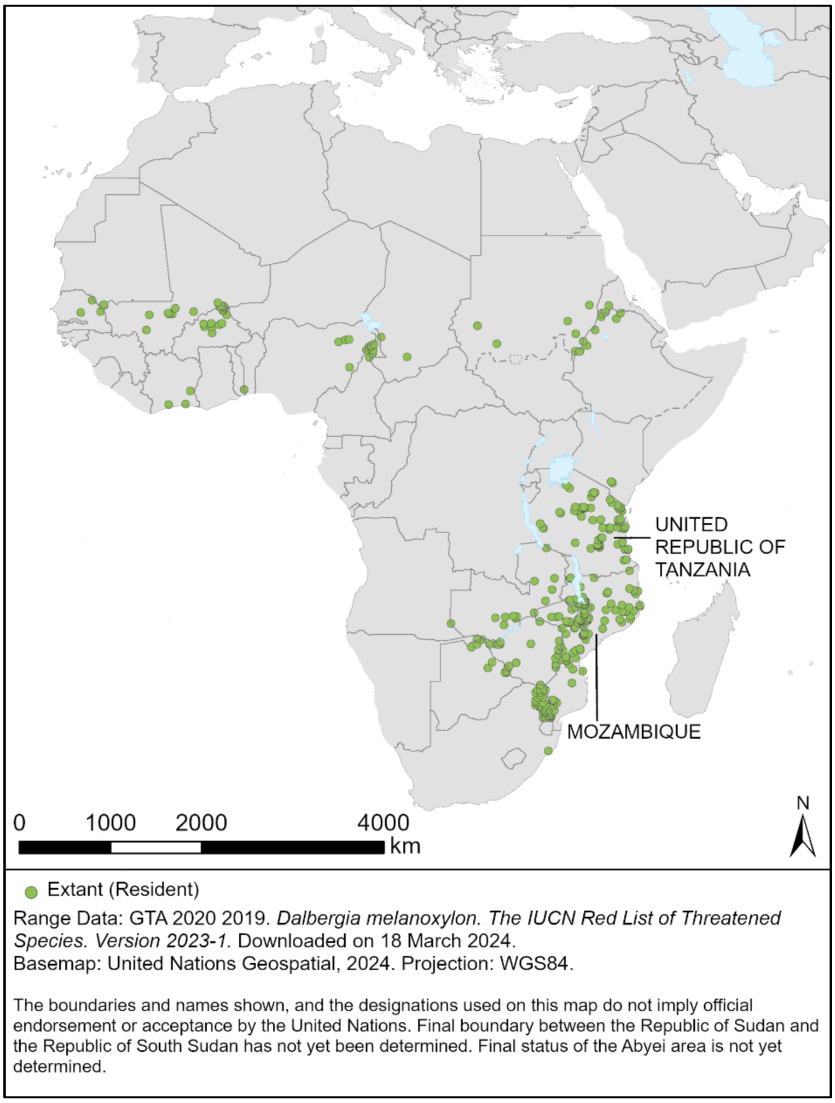


Figure 1.1. Range of *D. melanoxylon*

Population status and trends: *D. melanoxylon* was categorised as globally Near Threatened by the IUCN Red List in 2020, based on a suspected population decline of 20-30% over the past 150 years as a result of overexploitation for timber in Kenya (Barstow, 2020). An additional future population decline of 20-30% by 2120 has been projected for the species, based on significant ongoing logging in Mozambique and the United Republic of Tanzania (hereafter Tanzania) (Barstow, 2020).

The species is considered commercially exhausted throughout Kenya and in parts of Mozambique and Tanzania (Barstow, 2020; Jenkins *et al.*, 2002); Jenkins *et al.* (2012) considered commercially viable stands of *D. melanoxylon* to be restricted to these latter two countries, with only remnant trees remaining outside of them. Population declines were reported to be ongoing in East and Southern Africa, with the most substantial declines occurring in East Africa where commercial stands are concentrated (Ball, 2004; Barstow, 2020; Jenkins *et al.*, 2012).

Although exploitation threatens the species' long-term commercial viability (Ball, 2004; Barstow, 2020; Cunningham, 2016; Jenkins *et al.*, 2012), *D. melanoxylon* is not generally considered at immediate risk of global extinction due to its wide range and the persistence of some non-commercial stands (Ball, 2004; Barstow, 2020; Cunningham, 2016; Jenkins *et al.*, 2002). However, a summary of studies on the species conducted 2001-2016 found size class distributions typical of "unstable" populations and found indications of "poor recruitment" (Winfield *et al.*, 2016). Information on the status of the species throughout its West and Central African range is generally lacking (Barstow, 2020).

The species' slow maturation impedes recovery after logging (Barstow, 2020), and selective harvest of the most commercially valuable trees is considered to have reduced the species' genetic diversity (Lemmens, 2008).

Threats: Commonly referred to as African blackwood, Mpingo or Granadilla, the species' dense, durable black heartwood makes it a popular species for manufacturing musical instruments, reaching export values of at least USD 18 000/m^3 (Barros *et al.*, 2021); this is the primary destination for *D. melanoxylon* wood (Barros *et al.*, 2021; Barstow, 2020; Jenkins *et al.*, 2012). The species' traditional use in woodcarving has also developed into a regional tourist industry in East Africa, particularly in Kenya, which was reported to import the species from Tanzania and Mozambique as the national population has been exhausted (Jenkins *et al.*, 2002).

In addition, the species is subject to increasing demand for manufacture of Chinese hongmu furniture and panelling (Richards *et al.*, 2022; Zhang & Hin Keong, 2022). *D. melanoxylon* first entered the Chinese market around 2005 and since 2017 is imported mainly in the form of planks from Mozambique (Zhang & Hin Keong, 2022). Following the CITES listing in 2017, the market price for *D. melanoxylon* was reported to have remained fairly stable, due to the existence of ample supply within China and lower demand than expected (Zhang & Hin Keong, 2022). However, Richards *et al.* (2022) noted a regional shift in supply of hongmu away from Southeast Asian species and towards African species, with >80% of the trade in recent years originating from Africa.

A significant proportion logging of the species appears to be illegal, particularly in Mozambique for the hongmu market (Chang & Peng, 2015; EIA, 2014; ITTO, 2023). Timber from trees grown in plantations is considered of inferior quality to wild-harvested *D. melanoxylon* (Jenkins *et al.*, 2012).

The species is also threatened by habitat degradation and conversion throughout its range (Barstow, 2020; Jenkins *et al.*, 2012; Lemmens, 2008); in some areas, selective extraction of commercial stands has facilitated agricultural conversion of the "devalued" woodland (Jenkins *et al.*, 2012). Anthropogenic changes to miombo woodland fire regimes can also lead to more frequent and intense fires (Gregory *et al.*, 1999) that limit *D. melanoxylon* recruitment (Lemmens, 2008) and can damage trees, making them susceptible to fungal infection and subsequent heartwood rot (Orwa *et al.*, 2009).

Aridification and desertification of habitat exacerbated by climate change may also reduce the species' regeneration (Barstow, 2020).

Overview of trade and management: *D. melanoxylon* was listed in CITES Appendix II on 2 January 2017 as part of the genus listing for *Dalbergia* spp. with annotation CoP17 #15; the listing currently carries annotation CoP18 #15[2].

According to the CITES Trade Database, global direct trade in *D. melanoxylon* 2017-2022 predominantly consisted of wild-sourced timber, logs, sawn wood, and wood products for commercial purposes. As reported by exporters, direct wild-sourced trade in these top commodities for commercial purposes totalled 80 410 m^3 (60 190 m^3 reported by importers), 1.02 million kg (112 360 kg reported by importers), and 3.9 million specimens mostly traded as timber pieces (207 921 reported by importers)[3]. According to exporter-reported data, Mozambique exported >99% of these commodities by volume (m^3) and number of specimens, while almost all of the trade reported by weight (kg) was exported by Mozambique (86%) and Tanzania (12%). Trade levels for these commodities fluctuated over the six-year period, with particularly high volumes of trade in timber pieces occurring between 2017-2020.

D. Country reviews

Mozambique

Distribution: Barstow (2020) described *D. melanoxylon* as "widely distributed" in Mozambique, occurring naturally from the Cabo Delgado and Niassa provinces in the north to the Gaza province in the south of the country. The species was reported to be most abundant in the north of Mozambique, notably in Cabo Delgado province (Jenkins *et al.*, 2002).

Population status and trends: Stands in the north of Mozambique have been described as the only ones where commercial harvest is viable in the country (Jenkins *et al.*, 2012). A field study conducted by Hofiço and Fleig (2015) in Zambézia province (central Mozambique) found *D. melanoxylon* to be "locally rare" with average densities of one tree/ha, and with an increasing "lack of sapling recruitment". The species is considered commercially exhausted in some areas due to overexploitation (Barstow, 2020; Jenkins *et al.*, 2002).

Mozambique's latest national forest inventory, conducted 2015-2017, reported an inverted J-shaped population distribution for national forest stocks in general, indicating large numbers of individuals in smaller size classes; however, the inventory did not include population estimates or size structures for individual species (MITADER, 2018).

Threats: Growing demand for hongmu furniture is considered an increasing threat to *D. melanoxylon* in Mozambique (Barstow, 2020), overtaking demand from the musical instrument and woodcarving industries (UNEP-WCMC, 2017).

Mozambique's forest sector in general has been subject to reports of trade discrepancies, illegal logging and timber smuggling (Chang & Peng, 2015; EIA, 2014). For example, based on a comparison of the volume of officially licensed harvests with actual consumption 2007-2012, and extrapolating

[2] All parts and derivatives, except a) leaves, flowers, pollen, fruits and seeds; b) finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment; c) finished musical instruments, finished musical instrument parts and finished musical instrument accessories; d) parts and derivatives of *Dalbergia cochinchinensis*, which are covered by Annotation #4, and e) parts and derivatives of *Dalbergia* spp. originating and exported from Mexico, which are covered by Annotation #6.

[3] Quantities presented for different units of measure are additive rather than representing the same absolute quantities converted into different units.

trends into 2013, the EIA (2014) estimated that 93% of the country's overall logging was illegal, and 46% of timber exports to China were illegally smuggled out of the country[4]. A more recent project on forest governance in the country estimated that, based on literature analysis, approximately half of logging was illegal, and aimed to reduce this to 30% of licensed harvesting through activities aimed at strengthening forest governance (ITTO, 2023). Mozambique's national timber tracking and forest monitoring system was considered to be affected by corruption and "numerous flaws" (ITTO, 2023).

Mozambique is also generally experiencing high levels of forest loss and habitat degradation, including of the species' miombo woodland habitat (Joaquim-Meque *et al.*, 2023; Nhanengue *et al.*, 2016). The National Forestry Directorate estimated a loss of 2.2 million hectares of deciduous forest including miombo woodland between 2003-2013, corresponding to 78% of Mozambique's total forest loss during that period (Nhanengue *et al.*, 2016). The main drivers were conversion to agricultural land, followed by logging; soil quality of converted miombo is considered lost after three years of farming, leading to shifting agriculture and increased forest conversion (Nhanengue *et al.*, 2016). More recently, the FAO's Forest Resources Assessment for 2020 reported a net loss of 239 000 hectares of forest per year over the period 2015-2020 (FAO, 2020). Global Forest Watch (2024) also reported a total loss of ~4.3 million hectares of tree cover between 2001 and 2022, equivalent to a 15% decrease in overall tree cover since 2000, with the greatest losses occurring in Zambézia, Nampula and Niassa provinces (central and northern Mozambique).

Trade: Mozambique has submitted all annual reports to CITES for the period 2017-2021; the 2022 report had not yet been received at the time of writing. Mozambique has never published any CITES export quotas for this species.

Direct trade in *D. melanoxylon* from Mozambique 2017-2022 principally comprised wild-sourced timber (reported by Mozambique as 879 264 kg, 79 821 m^3, and 3.91 million pieces) traded for commercial purposes (Table 1.1). While Mozambique reported trade almost entirely as timber (except for 865 logs), importers reported wild-sourced logs (28 369 m^3) and sawn wood (11 075 m^3). According to Mozambique, the main importers of wild-sourced timber were China, Germany and Japan, with China importing the greatest proportion of timber pieces (86%) and Germany and China each importing approximately 42% of the timber reported by volume.

While Mozambique's 2022 annual report has not yet been received, a report for 2023 was submitted in October 2023 and included direct exports of 12 364 m^3 of *D. melanoxlyon* (mostly reported as 'saw logs' or 'pieces' without specified term codes). Forty-six percent of this trade was noted to be wild-sourced, but the source for the remainder was not specified[5].

Indirect trade in *D. melanoxylon* originating in Mozambique 2017-2022 consisted mostly of pre-Convention products, including 12 247 wood products and 7248 units of sawn wood reported by re-exporters (9414 and 3905, respectively, according to importers) (Table 1.2). Lower levels of wild-sourced wood products and sawn wood were also reported over this period.

[4] Approximately 10% of Mozambican timber exports to China in 2013 were estimated to be *D. melanoxylon* logs (EIA, 2014).

[5] UNEP-WCMC has queried the source and term codes for this trade and asked for confirmation that the report relates to trade in 2023 rather than 2022; a reply had not yet been received at the time of writing.

Table 1.1: Direct exports of *D. melanoxylon* from Mozambique, 2017-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Hyphens indicate where exporter annual reports have not yet been received.

.Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	number of specimens	T	O	Exporter						-	
				Importer		21					21
			W	Exporter						-	
				Importer			2				2
logs	m^3	T	O	Exporter						-	
				Importer	7064	110	877				8051
			W	Exporter						-	
				Importer	6515	1120	10232	7674	1737	1093	28369
	number of specimens	T	W	Exporter	60			805		-	865
				Importer							
sawn wood	m^3	T	O	Exporter						-	
				Importer	119	261	164				544
			W	Exporter						-	
				Importer	10	2635	2967	988	715	3761	11075
	number of specimens	T	W	Exporter						-	
				Importer						420	420
timber	kg	T	W	Exporter	870500				8764	-	879264
				Importer							
	m^3	T	W	Exporter		10104		34472	35245	-	79821
				Importer			1				1
			-	Exporter		7					7
				Importer							
		-	W	Exporter		152					152
				Importer							
	number of specimens	P	W	Exporter			9			-	9
				Importer							
		T	W	Exporter	322409	2146431	959978	477996	670	-	3907484
				Importer							
			-	Exporter		13530				-	13530
				Importer							
		-	W	Exporter	3757	4520				-	8277
				Importer							

.Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
unspecified	number of specimens	T	W	Exporter		111				-	111
				Importer							
wood product	kg	T	W	Exporter						-	
				Importer					40		40
	m^3	T	W	Exporter						-	
				Importer			122				122
	number of specimens	P	W	Exporter						-	
				Importer	1		7				8
		T	W	Exporter						-	
				Importer	1	6			54		61

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 1.2: Indirect exports of *D. melanoxylon* originating in Mozambique, 2017-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Term, unit, source, and purpose combinations reported at total quantities of less than five by both exporters and importers have been excluded.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	kg	T	O	Exporter	98	4					102
				Importer							
	number of specimens	T	O	Exporter	109	169	181				459
				Importer	79	3	12				94
derivatives	number of specimens	T	O	Exporter	5	5					10
				Importer		3					3
jewellery	number of specimens	T	W	Exporter							
				Importer		47					47
logs	m^3	T	O	Exporter							
				Importer		9					9
sawn wood	kg	T	O	Exporter							
				Importer						57	57
	m^3	T	O	Exporter	0.3	30	10	4	4	1	48
				Importer	0.01	6	0.1	0.6	0.7	1	8
			W	Exporter		0.9	2	18	12	18	51
				Importer		0.1		11	5	6	22
	number of specimens	T	O	Exporter	4258	763			2227		7248
				Importer	25	3600		170	10	100	3905
timber	kg	T	O	Exporter							
				Importer		42					42
wood product	kg	T	O	Exporter	1	86	115				202
				Importer	2	3	7				12
	number of specimens	P	W	Exporter			5				5
				Importer							
		Q	U	Exporter							
				Importer	7						7
		T	A	Exporter		2					2
				Importer		5		6			11
			O	Exporter	1036	4182	7029				12247
				Importer	1684	2672	4892	97	69		9414
			W	Exporter		76	238				314
				Importer	2	21	21	32	36		112

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: *D. melanoxylon* was classified as a precious wood species in Mozambique by Ministerial Order No. 265/2005 of 31 December 2005. Under Decree No. 12/81 of 25 July 1981, timber of precious wood species may not be used in the domestic construction industry, and the amount used for "cultural and artistic purposes" domestically must be established by a joint order of the Ministries of Education and of Culture and Environment. In addition, Law No. 17/2023 of 29 December 2023 prohibits the use of precious wood species for charcoal or firewood, with the exception of wood processing residues from sustainable forestry carried out by authorised operators under an approved management plan.

Law No. 14/2016 of 30 December 2016 prohibits the export of unprocessed logs and beams of native tree species.

Mozambique's national legislation is included in Category 2 in the CITES National Legislation Project (legislation that is believed generally to meet one to three of the four requirements for effective implementation of CITES). The most recent legislative status table (updated November 2023) noted that CITES-specific legislation and a comprehensive implementing regulation had been enacted/adopted and submitted to the Secretariat. Next steps included comments and clarifications from the Secretariat to be reviewed by Mozambique, as well as agreement between Mozambique and the CITES Secretariat on a revised legislative analysis, including possible Category 1 status.

Harvesting regime and quotas: Only limited information for limited time periods could be located regarding Mozambique's annual allowable cut (AAC) and harvest quotas for the species (it is unclear how these two figures relate to each other). An AAC was only located for the period 2015-2017 as outlined in Mozambique's national forest inventory; the total AAC for *D. melanoxylon* was reported to be 20 040 m^3 and to be distributed to particular provinces as shown in Table 1.3 (MITADER, 2018); however, given that the province level quotas add up to 14 034 m^3, it is unclear if this list is comprehensive. *D. melanoxylon* plus two additional species (*Guibourtia conjugata* and *Sprisotachys africana*) accounted for 81% of the national AAC for timber species legally classified as precious wood over this period, and for 63% of the AAC for precious timber for the Cabo Delgado province (MITADER, 2018). No information was located regarding how the AAC was calculated, and no information could be located regarding whether a similar AAC remains in place or has since been updated.

Table 1.3: Annual allowable cut for *D. melanoxylon* by province, 2015-2017. Source: MITADER, 2018. Figures in brackets are assumed to be confidence intervals.

Province	Annual allowable cut (m^3)
Cabo Delgado	6367 (4904 –7829)
Nampula	3813 (2214 – 5411)
Zambézia	2638 (2164 – 3111)
Manica	615 (207 – 1024)
Gaza	260 (192 – 327)
Tete	227 (220 – 334)
Sofala	114 (90 – 137)
Inhambane	0
Maputo	0
Niassa	0

The only harvest quotas that could be located for the species were those in Ministerial Decision of 1 April 2016, which set a total quota for *D. melanoxylon* of 1845 tonnes for the year, allocated to different provinces as shown in Table 1.4. As with the AAC, no information could be located regarding how the felling quota is calculated, and it is unclear if similar quotas remain in place or whether they have since been updated. Quotas were not set for the Gaza and Maputo provinces, despite Gaza province having an AAC for the species according to MITADER (2018).

Table 1.4: Felling quotas for *D. melanoxylon* in 2016 by province as set out in Ministerial Decision of 1 April 2016.

Province	Quota (tonnes)
Cabo Delgado	750
Nampula	700
Zambézia	200
Manica	100
Sofala	50
Tete	25
Inhambane	20
Niassa	0

Non-detriment findings: The only forestry management parameter for *D. melanoxylon* in Mozambique that could be located was a minimum exploitable diameter for the species of 20 cm DBH, set by Ministerial Order No. 52-C/2003 of 20 May 2003. No other information was located regarding management parameters such as a minimum density for exploitation or minimum cutting cycle, and as noted above, the methodology used to set annual allowable cuts/harvest volumes is unclear. As Mozambique did not reply to the consultation, no further information is available on how non-detriment findings are made or their scientific basis.

Protected areas: No specific occurrence records were located.

Illegal trade: While the TRAFFIC Wildlife Trade Portal holds only one record of a seizure involving *D. melanoxylon* from Mozambique between 2013–2023 (100 containers of wood were seized at the Port of Pemba in 2020; TRAFFIC International, 2024), the Mozambican forest sector was reported to have a high level of illegal harvest for international export, driving unsustainable logging (EIA, 2014; see *Threats* section).

United Republic of Tanzania

Distribution: *D. melanoxylon* occurs most frequently in dry, open savanna miombo woodland in Tanzania (Gregory *et al.*, 1999). The country's miombo woodlands cover 44.7 million hectares (~93% of Tanzania's total forest area) and are distributed throughout the south, west and southeast of Tanzania (MNRT, 2015). The largest stands of *D. melanoxylon* have been reported from the southeast of the country (Jenkins *et al.*, 2012).

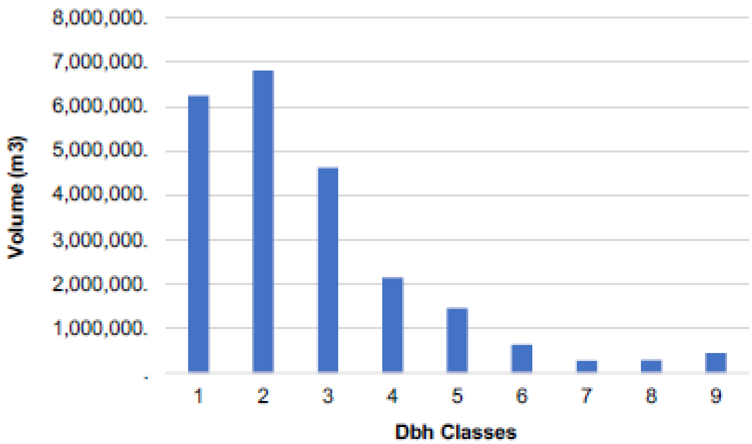
Population status and trends: The National Forest Resources Monitoring and Assessment of Tanzania (NAFORMA), conducted by the Tanzania Forest Services Agency (TFS) over the five-year period 2009-2014, used stratified sampling of 3420 sampling clusters consisting of 32 660 plots across all land cover types to inventory the country's forest stocks (MNRT, 2015). The NAFORMA estimated a total population size of approx. 1.3 billion *D. melanoxylon* stems, representing a timber volume of

~22.9 million m^3 (MNRT, 2015; CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023). The distribution of size classes (by DBH) of *D. melanoxylon* in Tanzania was found to represent a reverse J-shaped curve with a large number of individuals in the smallest size classes, indicating good regeneration potential (Table 1.5 and Figure 1.2; CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023).

Table 1.5: Size class distribution of the estimated total number of stems and timber volume of *D. melanoxylon* in Tanzania, based on the 2009-2014 NAFORMA. Source: CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023).

DBH classes (cm)	DBH class category (see Figure 1.2)	Estimated number of stems	Estimated volume (m^3)
0-9.9	1	1 215 080 157.55	6 240 975.36
10-19.9	2	81 840 477.37	6 798 682.73
20-29.9	3	16 799 976.82	4 624 834.12
30-39.9	4	3 293 232.19	2 146 496.06
40-49.9	5	1 350 005.68	1 469 865.33
50-59.9	6	389 156.79	638 362.44
60-69.9	7	106 572.53	279 113.41
70-79.9	8	74 178.58	283 968.02
80-89.9	9	92 250.28	458 698.80
Total:		**1 319 026 007.79**	**22 940 996.28**

Figure 1.2: Size class distribution of the estimated volume of *D. melanoxylon* (m^3) in Tanzania, calculated on the basis of the 2009-2014 NAFORMA. DBH class numbers correspond to those outlined in Table 1.5. Source: CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023).



The high numbers of large individuals reported in the NAFORMA (see Table 1.5) appears contrary to the assertion in the species' 2020 IUCN Red List assessment that the majority of large trees have been logged (Barstow, 2020).

The only population density estimates that could be located were from a 2017 survey conducted in Kilwa district, Lindi region (southeast Tanzania), where *D. melanoxylon* population density was found to range from 32 trees/ha to 57 trees/ha. "Some" trees of >50 cm DBH were noted to have been observed at all survey sites (Nakai *et al.*, 2019), which also contradicts the assertion that most large trees have been logged.

Threats: While the CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) reported that there were "no serious threats" to *D. melanoxylon* in the country, it did acknowledge that threats had been reported in the wider literature, including the impact on regeneration from wildfires (see Washa (2021)) and herbivore browsing, and some damage to logs from fungal infections and boring beetles.

However, a literature review by Washa (2021) concluded that *D. melanoxylon* in Tanzania was at risk from overharvest for international trade, with Jenkins *et al.* (2012) considering harvest rates in the country to be "a major concern and very likely to be unsustainable" as a result of the species' long maturation time and the "uncertainty" of remaining stocks. Tanzania's national environmental strategic plan similarly highlighted *D. melanoxylon* as a species driven to "near extinction" as a result of logging (United Republic of Tanzania, 2022), and the 2020 global IUCN Red List assessment for *D. melanoxylon* emphasised the threat from overharvest in Tanzania, forecasting that continued high demand may lead to commercial exhaustion of national stocks in future (Barstow, 2020). Notably, "export-grade" *D. melanoxylon* was reported to have already been extirpated from Rufiji district in eastern Tanzania, causing supply to shift further south (Jenkins *et al.*, 2002).

Concerns regarding overharvest and illegal logging in the Tanzanian forest sector in general were also identified by the country's 2009-2014 NAFORMA, which estimated an annual deficit of 19.5 million m^3 of legal timber between the 62.3 million m^3 estimated annual consumption and the 42.8 million m^3 annual allowable cut (MNRT, 2015). The NAFORMA concluded that this deficit (of around one third of harvest) was met by unsustainable harvesting in legally accessible forests and illegal logging, including within protected areas (MNRT, 2015).

Illegal forest conversion to agriculture was also noted to be a substantial risk in Tanzania (Dummett & Tenorio Fenton, 2022). The country's national environmental strategic plan for 2022-2032 noted that interventions to combat deforestation had been "either inadequate or poorly implemented", although several ongoing activities aim to strengthen the national approach (see *Management* section) (United Republic of Tanzania, 2022).

Trade: Tanzania has submitted all annual reports to CITES for the period 2017-2022 except for 2021, which had not been received at the time of writing. Tanzania has not published any CITES export quotas for this species.

Direct trade in *D. melanoxylon* from Tanzania 2017-2022 principally comprised wild-sourced sawn wood (reported as 72 762 kg, 578 m^3, and 8700 units) and timber (44 400 kg) traded for commercial purposes as reported by Tanzania (Table 1.6). Volumes of trade in wild-sourced sawn wood and timber were highest in 2022 according to both Tanzania and importers, and major importers of these commodities over the five-year period were China, Republic of Korea, and Germany. Lower levels of trade in wild-sourced wood products and carvings were also reported.

Indirect trade in *D. melanoxylon* originating in Tanzania predominantly comprised wild-sourced and pre-Convention wood products (89 431 and 4176 wood products, respectively) and 5059 kg of wild-sourced sawn wood traded for commercial purposes, according to re-exporters (Table 1.7).

In response to the request for information from the CITES Secretariat, Tanzania provided a summary of the amount of *D. melanoxylon* exported over the period 2018-2023, which totalled 18 374.88 kg and 8584.69 m^3. Tanzania noted that trade reported by weight (kg) mostly consisted of carvings and that trade reported by volume (m^3) was mostly clarinets and sawn wood. These quantities are much lower than the direct exports from Tanzania reported in the CITES Trade Database.

Table 1.6: Direct exports of *D. melanoxylon* from Tanzania, 2017-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Term, unit, source, and purpose combinations reported at total quantities of less than five by both exporters and importers have been excluded. Hyphens indicate where exporter annual reports have not yet been received.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	kg	P	W	Exporter			225	501	-		726
				Importer			182	52	69		303
		Q	W	Exporter			72		-		72
				Importer							
		T	O	Exporter					-		
				Importer		112					112
			W	Exporter		23	1060	5287	-	1076	7446
				Importer		157			358		515
	number of specimens	T	W	Exporter					-		
				Importer			659	1			660
logs	m^3	T	W	Exporter					-		
				Importer						18	18
sawn wood	kg	T	W	Exporter	44400	626	27736		-		72762
				Importer			107080				107080
	m^3	T	W	Exporter	45	172	20	82	-	259	578
				Importer	11	41	20	55	135	298	561
	number of specimens	T	W	Exporter		8700			-		8700
				Importer							
timber	kg	T	W	Exporter		44400			-		44400
				Importer							
	m^3	T	W	Exporter	11				-		11
				Importer			4				4
wood product	kg	T	W	Exporter					-		
				Importer		240			5000		5240
	m^3	T	W	Exporter					-		
				Importer	2		30			8	39
	number of specimens	E	W	Exporter					-		
				Importer		19					19
			O	Exporter					-		
				Importer	16500						16500
			W	Exporter		8700			-		8700
				Importer		148687	58731			2	207420

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 1.7: Indirect exports of *D. melanoxylon* originating in Tanzania, 2017-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Term, unit, source, and purpose combinations reported at total quantities less than or equal to five by both exporters and importers have been excluded.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	kg	P	O	Exporter					7		7
				Importer							
		T	O	Exporter	123	63					186
				Importer							
			W	Exporter	14						14
				Importer							
	number of specimens	T	O	Exporter	503	1053	271				1827
				Importer	68	5	24				97
			W	Exporter							
				Importer		2	23			1	26
derivatives	number of specimens	T	O	Exporter							
				Importer		20					20
sawn wood	kg	T	O	Exporter	4678	381					5059
				Importer	3142						3142
	m^3	T	W	Exporter		0.6	2	0.1	3	2	8
				Importer		1	0.03	0.04	0.02		1
wood product	kg	T	O	Exporter		353	335				689
				Importer	2	13	25				41
			W	Exporter			4		5		9
				Importer							
	m^3	T	O	Exporter	2	4	0.008				6
				Importer	0.005	4	3				7
	number of specimens	P	O	Exporter	5	1					6
				Importer		1					1
		T	A	Exporter							
				Importer		21					21
			O	Exporter	1145	1299	1732				4176
				Importer	566	10228	199	79			11072
			U	Exporter	15						15
				Importer							
			W	Exporter		50516	38615		300		89431
				Importer	20	224	352	29			625

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: *D. melanoxylon* does not appear to be protected by species-specific legislation in Tanzania. Export of raw logs of any species from Tanzania is prohibited under the Forest Regulations of 2004.

Tanzania's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Harvesting regime and quotas: *D. melanoxylon* was classified under the Forest Regulations of 2004 as a Class I timber species, which have the highest logging fees per cubic metre. Harvest was reported to take place in natural forests owned by the central and local governments; in both cases, harvest is contingent on having a forest management plan as well as a forest harvesting plan (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023).

The allowable cut (also referred to as the harvesting quota) appears to be set on the basis of individual forest harvesting plans (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023), but the methodology that is used to calculate this is unclear. The national combined annual allowable cut (AAC) for all timber was reported to be 42.8 million m^3 over the period 2009-2014 (MNRT, 2015), but neither more recent information on the combined AAC, or a species-specific AAC, could be located.

A minimum exploitable diameter and minimum girth of 24 cm and 75 cm respectively are set for the species under Tanzania's Forest Regulations of 2004, but no information could be located regarding whether there is a legally defined minimum density for logging or minimum cutting cycle. The CITES MA of Tanzania noted that harvesting "is only permitted if the Scientific Authority demonstrate sufficient regeneration potential" (CITES MA of Tanzania *in litt*. to the CITES Secretariat, 2023), which could be indicative that a minimum recovery rate is required, however no further details were provided.

Non-detriment findings: The CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) noted that it uses the 9-step process for making non-detriment findings (NDFs) for CITES-listed timber species, with NDFs appearing to be made at the level of individual forest management units. The MA noted that the following information is considered: (1) information on the location of harvest and how many companies are harvesting in the relevant forest management unit; (2) the month and year of harvest; and (3) the management plan for the forest, which if possible should contain:

- its location
- information on the population size and structure
- annual growth and regeneration rates
- how sustainable harvesting is assessed at the site
- monitoring and management measures at the site
- information on the permitted volume to be harvested, actual harvested volume, and the approved export volume.

Monitoring: The 2009-2014 NAFORMA established ~7693 permanent forest plots (25% of the total plots measured during the forest inventory) for long-term monitoring (MNRT, 2015). The TFS plans to conduct a second NAFORMA, which will involve adjusting and simplifying the sampling design of the first NAFORMA to ensure uniform sampling intensity and improve its provision for long-term forest monitoring (Rajala *et al.*, 2022). The planned timetable of the second NAFORMA is unclear, but fieldwork was conducted in 2021 to test the proposed sampling approach (Rajala *et al.*, 2022).

Certification schemes: The Mpingo Conservation Development Initiative (MCDI), an NGO based in southeast Tanzania, uses a Participatory Forest Management (PFM) model to support Village Land Forest Reserve (VLFR) communities to achieve sustainable and socially equitable harvest of *D. melanoxylon* and conservation of miombo woodland (Sheil *et al.*, 2010). MCDI established a group forest management certification scheme based on Forest Stewardship Council criteria in 2009 (Sheil *et al.*, 2010). Participating communities own the rights to their timber trees and can claim logging license fees as revenue (Mpingo Conservation Project, 2006), although a community's certificate may be suspended for persistent failure to meet requirements (Sheil *et al.*, 2010). Participating VLFRs establish a 'no take zone' of ~13% of the forest area, conduct at least two forest patrols per month, and conduct forest monitoring and fire management (MCDI, 2019; Sheil *et al.*, 2010). The MCDI's 2018-19 annual report notes that it has supported 43 villages across eight districts to sustainably manage a total 413 767 ha of forest and run 290 forest patrols (leading to a reduction in illegal logging), and plant a total 7000 *D. melanoxylon* seedlings (MCDI, 2019). Work is mainly focussed in the Lindi region of southeast Tanzania (MCDI, 2019).

Plantations: The species is not grown in plantations or artificially propagated in Tanzania (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023).

Management of other threats: The CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) reported that controlled burning of woodland biomass and satellite detection of wildfires were in operation to reduce the impact of fire on *D. melanoxylon* regeneration.

Tanzania's national environmental strategic plan for 2022-2032 also listed numerous ongoing measures aimed at addressing deforestation nationally (United Republic of Tanzania, 2022). Development of a strategy for strengthening forest resources legislation is also anticipated by 2025 (United Republic of Tanzania, 2022).

Protected areas: *D. melanoxylon* occurs in National Forest Reserves (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023). However, a high level of illegal forest conversion within protected areas over the period 2002-2021 has been considered indicative of inadequate forest protection (Dummett & Tenorio Fenton, 2022).

Illegal trade: Tanzania is noted to have implemented a strong traceability system (known as the Forestry Resource and Management Information System (FREMIS)) for timber in 2019 (Mgaza, 2022; Momballa-Mbun *et al.*, 2023); in an overview of timber traceability systems, TRAFFIC referred to it as a "champion system… successful and accepted" (Momballa-Mbun *et al.*, 2023).

The TRAFFIC Wildlife Trade Portal holds two record of seizures involving *D. melanoxylon* from Tanzania between 2013–2023; 59 950 pieces of *D. melanoxylon* were seized in 2016, and a container of *D. melanoxylon* handicrafts was seized in 2017, both at Dar es Salaam sea port (TRAFFIC International, 2024). The CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) reported no evidence of illegal trade in *D. melanoxylon*.

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Trade in commodities whose export appears to have been nationally prohibited

While Law No. 14/2016 of 30 December 2016 prohibits the export of unprocessed logs and beams of native tree species in Mozambique, exports of wild-sourced *D. melanoxylon* logs and timber[6] were recorded in the CITES Trade Database 2017-2022 by both Mozambique and importers. High levels of illegal harvest for international export has been identified as a concern in Mozambique's forest sector more widely (EIA, 2014; see *Mozambique: Threats* section).

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Dalbergia tucurensis: Nicaragua

A. Summary

CRITERIA MET:	Criterion i) trade in an endangered species and criterion v) high volume of trade in a globally threatened species.
GLOBAL STATUS:	Globally Endangered (2019 assessment), based on an estimated 50% population decline over the past three generations. However, it is unclear if the species concept assessed is the same species concept recognised under the CITES standard nomenclature reference or by Nicaragua.
NICARAGUA: Responded to the consultation relating to the RST	*D. tucurensis* occurs throughout Nicaragua but appears to be concentrated in the north of the country, in the provinces of Matagalpa, Jinotega, and the Autonomous Region of the Northern Caribbean Coast. No population estimates are available, however the species has been surveyed as part of Nicaragua's National Forest Inventory and two other large studies. On the basis of data available, Nicaragua did not consider the species to be threatened in the country. Nicaragua has submitted CITES annual reports for all years 2014-2022 and has not published any CITES export quotas for this species. Direct exports 2014-2022 predominantly comprised wild-sourced sawn wood for commercial purposes (8371 m^3 reported by Nicaragua and 1030 m^3 reported by importers); China additionally reported imports of 4173 m^3 of wild-sourced logs for commercial purposes. Nicaragua provided harvest volumes 2015-2022, which averaged 126.3 m^3 per year; these volumes appear insufficient to account for the exports reported (noting that no timber in trade over this period was reported as pre-Convention). Annual harvest quotas were reported to be calculated using a modified Von Mantel formula, but quotas for 2014-2022 were not provided. Harvest is only permitted with an approved management plan; the minimum cutting diameter is 40 cm, and the minimum cutting cycle is 15 years; however, these are general rather than species-specific parameters.
PROVISIONAL CATEGORY:	Baseline inventory data show a favourable regeneration potential for the species, and harvest levels appear to be low. Non-detriment findings are made on the basis of management plans for authorized areas, for which the management conditions are regulated by law. However, management parameters are generic rather than species-specific, and no management plans for specific harvest areas were available. In addition, there is some doubt as to whether the species exported in trade is *D. tucurensis*. On this basis, classified as **Action is needed.** Referral to the nomenclature specialist is also recommended due to taxonomic uncertainties associated with the species concept.

B. RST background

PC26 marked the first time that *Dalbergia tucurensis* has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Taxonomy: While Nicaragua is considered a range State of *D. tucurensis* Donn. Sm. in Kew's Plants of the World Online (Royal Botanic Gardens Kew, 2023) and in the original CoP proposal (CoP17 Prop. 54), the country is not included as a range State in either the IUCN assessment for the species (Linares & Martinez Salas, 2020a) or the CITES standard nomenclature reference for *Dalbergia* (Cowell *et al.*, 2022[7]) (which both use the same authority of Donn. Sm). *Dalbergia* is a complex genus, and the differences in the species concepts referred to as *D. tucurensis* in Kew's Plants of the World Online, the IUCN Red List, the CITES standard nomenclature reference, and Nicaragua's response to the consultation relating to the RST are unclear.

For the purposes of this review, the global distribution of *D. tucurensis* is considered to be that described in the CoP proposal for the species (CoP17 Prop. 54). However, further work is needed to fully understand the species concept referred to by different sources, as well as the status of synonyms. For example, Kew's Plants of the World Online and the IUCN Red List recognise the Least Concern species *D. cubilquitzensis* to be a synonym of *D. tucurensis,* and consider this species to occur in Nicaragua (Royal Botanic Gardens Kew, 2023; Linares & Martinez Salas, 2020b). However, the species is not considered a synonym by the CITES standard reference (Cowell *et al.*, 2022).

Biology: *D. tucurensis,* known as granadillo or granadillo amarillo (Centero & Zac, 2022; SC74 Doc. 30.1 Annex 5e), is a medium to large-sized rosewood-producing canopy tree species, reaching up to 35 m in height and 90 cm diameter at breast height (DBH) (Bawa *et al.*, 1985; Knoblauch, 2001; Linares & Martinez Salas, 2020a). Its heartwood timber is durable and resistant to degradation (Knoblauch, 2001), and has a red colour that makes it highly desirable (CoP17 Prop. 55).

According to the CITES *Dalbergia* Checklist (Cowell *et al.*, 2022), the species occurs in tropical moist montane forest at altitudes of 1500-2900 m, however other publications such as Herrera Sosa *et al.* (2016) and the Flora of Nicaragua (WOF, 2024) give altitudinal ranges of 120-550 m and 1300-1400 m respectively; the taxonomic uncertainty described above may account for some of these differences. Flowering (February to April) and fruiting (April to June) take place every two years (Centero & Zac, 2022). Bawa *et al.* (1985) describe the species as a hermaphrodite.

No species-specific information could be located regarding regeneration and growth rates, although in general the genus is noted to have slow growth and recruitment rates (CoP17 Prop. 54). Centero and Zac (2022) estimated that *Dalbergia* in central America reach their maximum height at around 30 years and have a DBH growth rate of 1.05 cm/year up until 40 years[8].

D. Country reviews

Nicaragua

Distribution: The global range of *D. tucurensis* stretches from Southern Mexico through to Nicaragua; the species has also been introduced to Costa Rica (CoP17 Prop. 54).

The distribution of *D. tucurensis* in Nicaragua has been assessed by the CITES MA of Nicaragua using (a) a Maximum Entropy (MaxEnt) model to predict species occurrence, drawing on information on

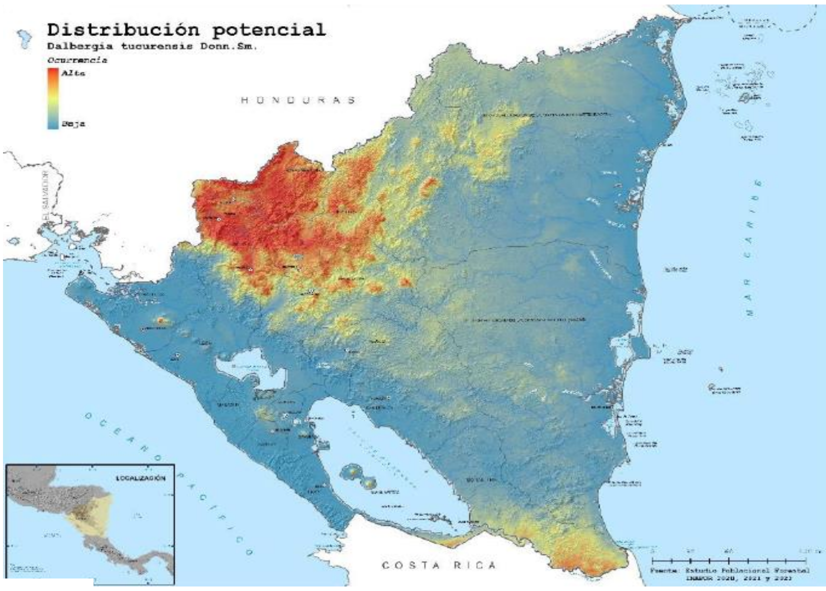
[7] Itself based on the World Checklist of Vascular Plants

[8] Species samples were *D. retusa*, *D. calderonii, D. melanocardium, D. stevensonii* and *D. glomerata*.

habitat, climatic preferences and geographic barriers from population surveys, (b) an inventory undertaken in 2020 of 128 circular plots of 0.52 ha, (c) sampling units (0.5 ha each) from 200 permanent plots that have been surveyed by the Nicaraguan Institute of Forestry in 2007-2008, 2011, 2012, 2019, 2020 and 2022 as part of the National Forestry Inventory (SC74 Doc. 30.1 Annex 5), and (d) a population study of forest species, carried out between 2021-2023 (CITES MA of Nicaragua *in litt.* to UNEP-WCMC, 2023).

The distribution map based on the MaxEnt model in (a) calculated a potential range of c. 3 million ha, and identified the north-eastern departments of Jinotega, Nueva Segovia, Madriz, Estelí, Matagalpa, and the Autonomous Region of the Northern Caribbean Coast as areas where the species was highly likely to occur Figure 2.1(i). However, the results of (b), (c) and (d) showed the species to have a wider distribution throughout the country. The species was reported to occur in 6 plots surveyed in (b) and 68 permanent plots (covering a total of 34 ha) surveyed in (c) (SC74 Doc. 30.1 Annex 5); occurrence records from (d) are shown in Figure 2.1 (ii).

(i)



(ii)

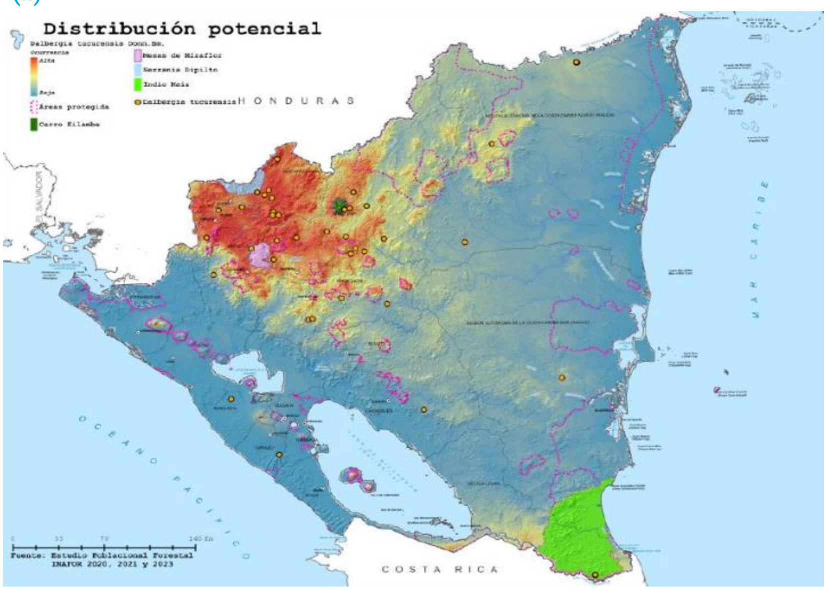


Figure 2.1: Distribution of *D. tucurensis* in Nicaragua. (i) shows the potential distribution of the species using a Max Ent model drawing on habitat, climatic preferences as well as geographic barriers from population surveys, and (ii) shows occurrence records, highlighting instances where the species is found within a protected area. Red areas indicate the highest probability of occurrence, blue areas indicate the lowest probability of occurrence. Source: CITES MA of Nicaragua *in litt.* to UNEP-WCMC, 2023.

The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Population status and trends: No global population estimates were located. The species was assessed as globally Endangered in a 2020 IUCN assessment, based on an inferred decline of more than 50% over the last three generations (Linares & Martinez Salas, 2020a). The inferred decline is based on a reported decline of 42% over a 12-year period for the species in Guatemala, and the assumption that over the last decade harvest of individuals for timber is likely to have increased due to growing international demand for rosewood (Linares & Martinez Salas, 2020a). However, it should be noted that the IUCN assessment does not recognise Nicaragua as a range State of the species, and the species concept the assessment is based on is unclear (see *Taxonomy* section).

The CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023) did not consider the species to be threatened in the country, on the basis of the following data:

National Forest Inventory: Two analyses of the number of trees/ha and volume of trees/ha that are based solely on, or have input from, the National Forest Inventory have been produced by Nicaragua; one is published in SC74 Doc 30.1 Annex 5e, and one was provided response to the consultation by UNEP-WCMC. Because each analysis covers different time periods and is derived from different surveys, they are presented here separately.

(1) **Diameter size class distribution for *D. tucurensis* surveyed as part of Nicaragua's National Forest Inventory in 2007-2008, 2011, 2012, 2019 as presented in SC74 Doc 30.1 Annex 5e.**

Table 2.1 shows the number of individuals of *D. tucurensis* identified in each inventory, noting that each had a different survey effort and geographic coverage.

Table 2.1: Density and volume/ha of *D. tucurensis* >10 cm DBH recorded in Nicaragua's National Forest Inventory.

Year	Number of trees/ha	Volume (m^3)/ha	Number of survey units	Number of plots
2007	5.67	0.25	6	8
2008	18.02	1.29	37	49
2011	1.39	0.04	1	2
2015	0.09	0.05	2	2
2019	0.41	0.45	4	7

Figure 2.2 shows the key parameters for the 101 *D. tucurensis* individuals identified across the 68 plots forming part of the inventory where the species occurs; it is unclear from the document how the results from different years are aggregated, and whether there is any overlap in plots surveyed in each year. The results were considered to show that there is a large number of young trees that will grow to reach the larger diameter sizes; 84% of stems measured were in the 10-39.9 cm DBH size class. Almost half (49%) of the volume recorded was noted to belong to individuals with a DBH of over 40 cm, indicating few individuals with a large DBH.

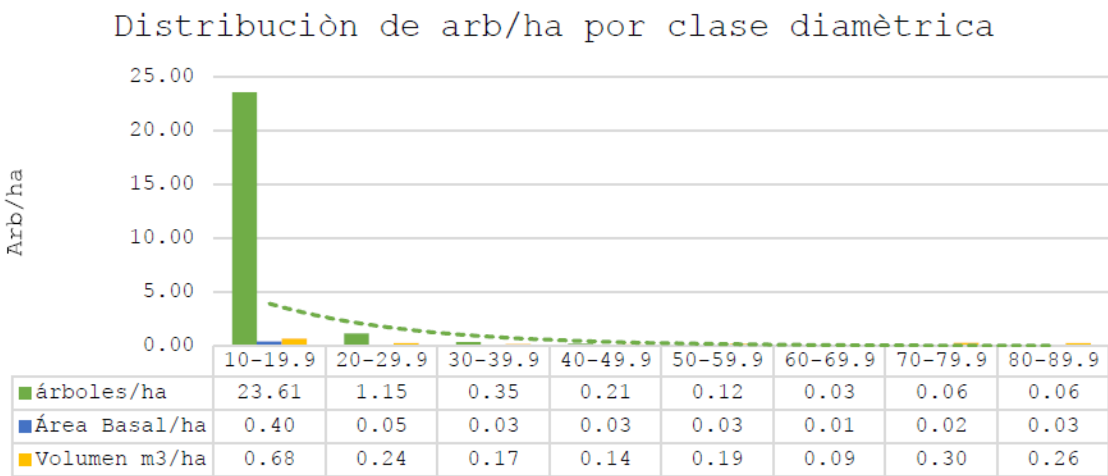


Figure 2.2: Diameter size class distribution of *D. tucurensis* across the 68 plots forming part of the Nicaragua's Forest Inventory where the species was recorded. Data are from 2007-2008, 2011, 2012, 2019. Source: SC74 Doc 30.1 Annex 5e.

(2) **Diameter size class distribution based on nine survey units from the National Forestry Inventory 2019-2023, and the 27 plots of the Forest Species Population Survey 2021 and 2023 in which *D. tucurensis* individuals were identified,** as communicated *in litt.* to UNEP-WCMC, (2023). The CITES MA of Nicaragua noted that the diameter size class distribution for *D. tucurensis* based on these data sources shows an inverted-J shape (Figure 2.3).

Table 2.2: Density, basal area and volume/ha of *D. tucurensis* recorded in nine survey units from the National Forestry Inventory 2019-2023, and the 27 plots of the Forest Species Population Survey 2021 and 2023 in which *D. tucurensis* individuals were identified. Source: CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023).

DBH diameter class (cm)	Number of trees/ha	Basal area (m^2)/ha	Volume (m^3)/ha
10-19.9	37.05	0.646	1.703
20-29.9	15.19	0.667	2.643
30-39.9	6.52	0.531	2.451
40-49.9	1.99	0.282	1.752
50-59.9	0.93	0.204	1.246
60-69.9	0.73	0.229	1.691
70-79.9	1.13	0.458	4.448
80-89.9	0.13	0.072	0.453
>90	0.00	0.0	0.0
Total	63.68	3.088	16.386

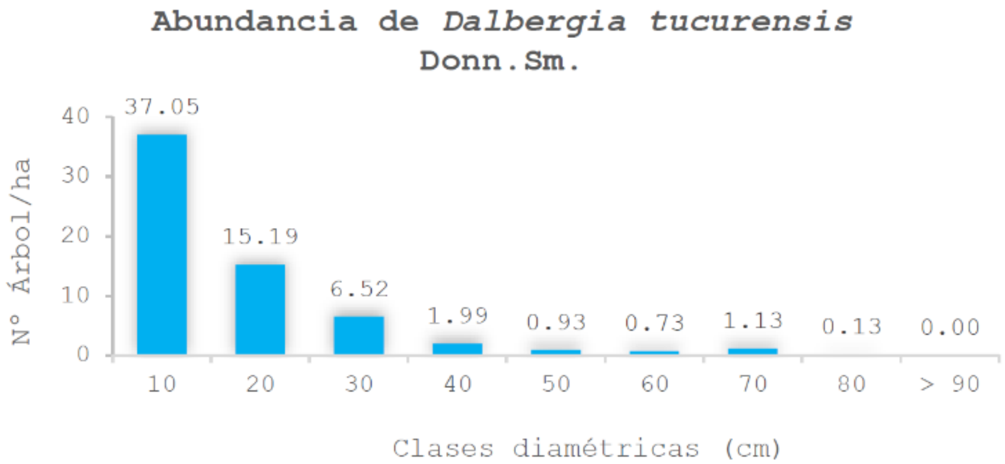


Figure 2.3: Diameter size class distribution of *D. tucurensis* across nine survey units from the National Forestry Inventory 2019-2023 and the 27 plots of the Forest Species Population Survey 2021 and 2023 in which *D. tucurensis* individuals were identified. Source: CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023).

2020 survey of 128 circular plots: Diameter size class distribution for the 18 *D. tucurensis* individuals identified in a 2020 survey of 128 circular plots as outlined in SC74 Doc 30.1 Annex 5 is shown in Table 2.3 and Figure 2.4.

Table 2.3: Diameter size class distribution 18 *D. tucurensis* individuals identified in a 2020 survey of 128 circular plots. Source: SC74 Doc 30.1 Annex 5e.

Diameter class (cm)	Number of trees	No. trees/ha	Basal area (m^2)/ha	Volume (m^3)/ha
10-19.9	3	0.962	0.023	0.046
20-29.9	3	0.962	0.059	0.211
30-39.9	7	2.244	0.180	1.293
40-49.9	2	0.641	0.095	0.422
50-59.9	2	0.641	0.139	0.469
60-69.9	1	0.321	0.173	1.093
Total	18	5.769	0.670	3.535

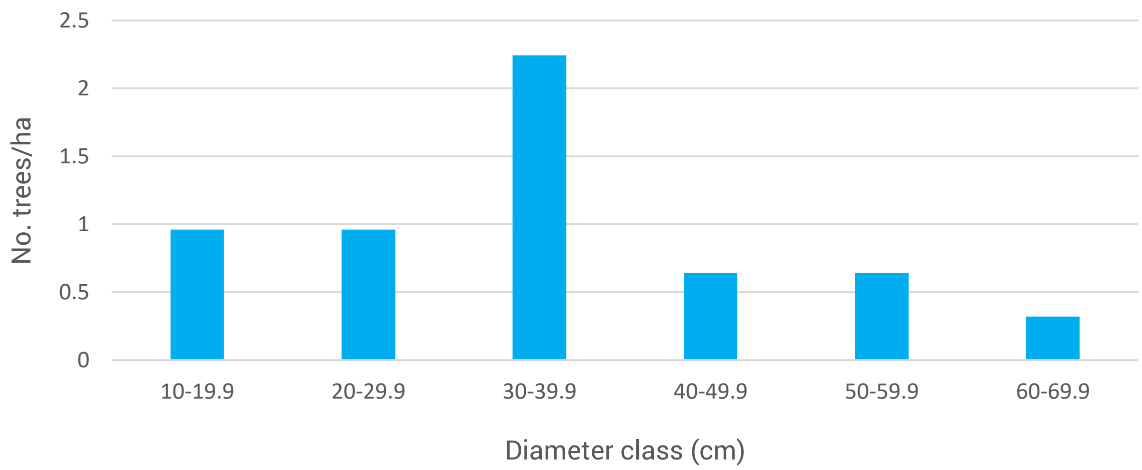


Figure 2.4: Diameter size class distribution of 18 *D. tucurensis* individuals identified in a 2020 survey of 128 circular plots.

Threats: Globally, the key threats to the species are habitat loss and loss of mature individuals for the timber trade (CoP17 Prop. 54). The habitats of *D. tucurensis* (specifically mesophilic montane forest) have been noted to be globally rare and particularly vulnerable, and highly threatened by conversion to agriculture and human settlements (CoP17 Prop. 54). The CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023) considered the major threats to the species in the country to be land use change, fires, and illegal exploitation. Harvest of *D. tucurensis* in the country was reported to be low and primarily for the export market; the MA provided harvest volumes for *D. tucurensis* 2015-2022 (Table 2.4), which averaged 126.3 m^3 a year. The number of approved harvest permits issued for Agrosilvopastoriles (5) or under Annual Operating Plans (2) are significantly lower than the number of approved Special permits (30), which are issued for trees that have fallen naturally, trees affected by pests, or trees that pose a safety risk.

Table 2.4: Volumes of *D. tucurensis* harvested in Nicaragua, 2015-2022. Source: CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023).

Year	Forest/permit type	Number of approved harvest permits	Volume extracted (m^3)	Total (m^3)
2015	Agrosilvopastoriles	0	0	199.244
	Annual Operating Plans	1	169.953	
	Special permits	2	29.291	
2016	Agrosilvopastoriles	0	0	0
	Annual Operating Plans	0	0	
	Special permits	0	0	
2017	Agrosilvopastoriles	4	30.84	255.986
	Annual Operating Plans	1	210	
	Special permits	3	15.146	
2018	Agrosilvopastoriles	1	16.48	392.399
	Annual Operating Plans	0	0	
	Special permits	9	375.919	
2019	Agrosilvopastoriles	0	0	87.374
	Annual Operating Plans	0	0	
	Special permits	8	87.374	
2020	Agrosilvopastoriles	0	0	20.825
	Annual Operating Plans	0	0	
	Special permits	1	20.825	
2021	Agrosilvopastoriles	0	0	3.094
	Annual Operating Plans	0	0	
	Special permits	3	3.094	
2022	Agrosilvopastoriles	0	0	51.312
	Annual Operating Plans	0	0	
	Special permits	4	51.312	

Trade: *D. tucurensis* was initially listed in CITES Appendix III by Nicaragua on 24 June 2014 with annotation CoP16 #6; the species was subsequently included in Appendix II as part of the genus listing of *Dalbergia* spp. on 2 January 2017 with annotation CoP17 #15[9]. Nicaragua has submitted CITES annual reports for all years 2014-2022, and has not published any CITES export quotas for this species.

[9] Current definition (CoP18 #15) denotes all parts and derivatives, except a) leaves, flowers, pollen, fruits, and seeds; b) finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment; c) finished musical instruments, finished musical instrument parts and finished musical instrument accessories; d) parts and derivatives of *Dalbergia cochinchinensis*, which are covered by Annotation #4; and 3) parts and derivatives of *Dalbergia* spp. originating and exported from Mexico, which are covered by Annotation #6.

According to the CITES Trade Database, direct trade in *D. tucurensis* from Nicaragua 2014-2022 predominantly comprised wild-sourced sawn wood (8371 m^3 reported by Nicaragua and 1030 m^3 reported by importers) and 4173 m^3 of wild-sourced logs (reported by China only) traded for commercial purposes (Table 2.5).

Indirect trade in *D. tucurensis* originating from Nicaragua mainly comprised 2923 m^3 of wild-sourced logs for commercial purposes (reported by importers only) (Table 2.6). Indirect trade also included negligible levels of trade in carvings, sawn wood, veneer, and wood products.

Table 2.5: Direct exports of *D. tucurensis* from Nicaragua, 2014-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable.

Term	Unit	Purpose	Source	Reported by	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
logs	m^3	T	W	Exporter										
				Importer	1269	1546	156	417	112	294	39	330	8	4173
sawn wood	m^3	T	A	Exporter			10							10
				Importer										
			O	Exporter										
				Importer	128									128
			W	Exporter	4409	1803	303	553	218	651	116	309	8	8371
				Importer	340	558	19	88		24				1030
		-	-	Exporter	39									39
				Importer										
	-	P	I	Exporter										
				Importer		2								2
timber	m^3	T	W	Exporter										
				Importer		33								33

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 2.6: Indirect exports of *D. tucurensis* originating in Nicaragua, 2014-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable.

Term	Unit	Purpose	Source	Reported by	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
carvings	-	T	O	Exporter					7	30				37
				Importer										
logs	m^3	T	W	Exporter				<< 1						<< 1
				Importer				438	2141	344				2923
sawn wood	kg	T	O	Exporter				12						12
				Importer										
	m	T	W	Exporter		0.001								0.001
				Importer										
	m^3	T	O	Exporter	2			<< 1			0.02	0.05		2
				Importer										
			W	Exporter	2						0.008			2
				Importer						0.2				0.2
veneer	m^3	T	W	Exporter					<< 1					<< 1
				Importer									0.3	0.3
wood product	kg	T	W	Exporter					2					2
				Importer										
	number of specimens	T	W	Exporter										
				Importer							2			2
	-	T	W	Exporter										
				Importer					20					20

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

The CITES MA of Nicaragua also provided data to the CITES Secretariat on exports as registered by Nicaragua's National Forestry Institute (INAFOR)'s Traceability System 2015-2022, as well as exports according to the MA's records 2018-2022; these are shown in Table 2.7. Discrepancies between the two data sets were noted to be possible if traders had requested authorisation from INAFOR but had not carried out CITES procedures with the Ministry of Environment and Natural Resources (MARENA) (CITES MA of Nicaragua *in litt.* to the CITES Secretariat, 2023).

Table 2.7: Exports of *D. tucurensis* as registered by INAFOR'S Traceability System 2015-2022 and CITES MA of Nicaragua's records 2018-2022. Source: CITES MA of Nicaragua *in litt.* to the CITES Secretariat, 2023.

Year	INAFOR'S Traceability System		CITES MA records
	No. permits issued	Amount in m^3	Amount in m^3
2015	60	1319.43	n/a
2016	11	186.87	n/a
2017	21	480.34	n/a
2018	12	224.96	207.766
2019	32	683.92	587.555
2020	8	114.05	114.047
2021	24	308.94	285.728
2022	1	8.25	8.25

Management:

Legislation:

Harvest: Nicaragua's main piece of national forestry legislation is Forestry Law 462 and its Regulation 73-2003. Combined with associated technical standards, these set general requirements for forestry exploitation, including the need for a management plan.

The amount of timber that can be extracted from authorised areas is known as the annual permissible harvesting volume (VCAP), which is issued annually on a species and municipal basis by INAFOR (Article 5 of Administrative Resolution No. DE 11-2015). The VCAP is based on the Nicaraguan technical standard for the sustainable management of broadleaf and conifer forests (NTON 18 001-12 second revision) as well as administrative resolution No. 11-2015, which establishes provisions for the sustainable management of broadleaf forests, conifer forests, and agroforestry systems, and sets requirements relating to cutting cycles. According to the CITES MA of Nicaragua (*in litt. to* UNEP-WCMC, 2023), the formula used to establish the VCAP is a modified Von Mantel formula:

$$VCAP = S_1 \times V_1 + S_n \times V_n \times \frac{I_c}{T}$$

Where S_n = surface of the stratum N
V_n = volume/ha of the stratum N
T = cutting cycle and
I_c = cutting intensity

The VCAP was also reported by the CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023) to consider the following:

- Forest cover type
- The total volume and commercial volume of timber in each municipality
- Authorised species in each municipality
- Cutting intensity (as per NTON 18 001-12, this is calculated as ((*Recuperated basal area/ Available basal area) x 100*), using an annual increment for dry tropical forest of 0.35 cm/DBH/year, and for moist tropical forest of 0.50 cm/DBH/year.
- The length of the cutting cycle by forest type or species (as per NTON 18 001-12, this must be a minimum of 15 years).

The technical standard (NTON 18 001-12 second revision) also specifies that the minimum cutting diameter should be 40 cm DBH, and that no more than 40% of the basal area of each species may be extracted. No cutting is allowed on steep slopes (>75% incline).

Export: Article 2 of Law No. 585 of June 2006 prohibited the export of roundwood, sawnwood and timber from natural forests, but Article 3 notes that wood from plantations, and any wood that has undergone secondary processing, are exempt from the ban (so long as the corresponding management plans have been followed).

Nicaragua's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Non-detriment findings: Non-detriment findings were reported to only be conducted in authorised areas, which are required to have a valid logging permit issued by INAFOR (Instituto Nacional Forestal) and an approved management plan (CITES MA Nicaragua *in litt.* to UNEP-WCMC, 2023).

Plantations: According to INAFOR's National Forestry Registration System, *D. tucurensis* plantations 2019-2022 covered c. 42 ha and comprised c. 6600 individuals (CITES MA of Nicaragua *in litt.* to UNEP-WCMC, 2023). Over 60% of the area covered by plantations was in the Autonomous Region of the Northern Caribbean Coast; plantations are also established in the departments of Boaco and Jinotega (CITES MA of Nicaragua *in litt.* to UNEP-WCMC, 2023).

Protected areas: Surveys conducted 2019-2023 identified the species in the Cerro Kilambé, Serranías de Dipilto and Mesas de Miraflor protected areas in the north-west of the country, as well as the Indio Maíz Biological Reserve in the south-east (Figure 4.1; CITES MA of Nicaragua *in litt.* to UNEP-WCMC, 2023).

Illegal trade: No seizures involving *D. tucurensis* from Nicaragua were reported within the TRAFFIC Wildlife Trade Portal 2013–2023; the only reported seizure of the species globally was of 29 000 kg seized in Hong Kong in 2018 that had originated in Honduras (TRAFFIC International, 2023). The CITES MA of Nicaragua (*in litt.* to UNEP-WCMC, 2023) reported low volumes of seizures of *D. tucurensis* 2015-2022; two in total, totalling 13.332 m^3, in the departments of Chinandega and Río San Juan.

CITES Tree Species Programme: Nicaragua was the beneficiary of a CITES Tree Species Programme project on capacity building and technical guidelines for the elaboration of NDFs for *Dalbergia* species. The outcomes of the project are available on the country page of the CTSP website: Nicaragua | CTSP (cites-tsp.org). They include an NDF prepared in 2021 for *D. retusa*, which entered the RST post CoP17. The document includes a number of recommendations which may also be relevant to *D. tucurensis*, as a species under the same legal management regime. These include, *inter alia*:

- To carry out a study that allows establishment of basic silvicultural guidelines, population dynamics, monitoring and establishment of seed trees, regeneration capacity and average annual increment;
- To establish a precautionary export quota while the above studies are carried out;
- To update the appropriate technical standard to create species-specific instruments.

Nicaragua are seeking funding for a field-testing phase of this project (SC77 Doc. 35.3).

Another relevant output of the CTSP project is the strategy for the conservation and sustainable use of *Dalbergia* in Guatemala, El Salvador and Nicaragua, published in 2022 (Governments of Guatemala, el Salvador and Nicaragua, 2022). The document contains a number of recommended actions for Nicaragua, which include, *inter alia:*

- Updating technical, legal and administrative regulations in the context of *Dalbergia* species management
- Developing conversion factors for roundwood to processed wood
- Continuing to monitor permanent plots
- Identifying and establishing seed stands in the wild
- Identifying and prioritising areas for forest landscape restoration
- Updating Nicaragua's traceability system to improve its efficiency and transparency
- Strengthening surveillance and enforcement action.

RST process for *Dalbergia retusa:* As noted above, the management of *D. tucurensis* occurs under the same legal regime as that for *D. retusa*, which was included in the RST post CoP17. Four recommendations were initially addressed to Nicaragua: (a) to provide information on the location and extent of areas under harvest management for export, (b) to submit management plans including available information on inventories and monitoring systems in place, (c) to develop an analysis of the status of the population at the national level, based on existing national forest inventories and forest inventories under development and plans for a monitoring process, and (d) upon completion of other recommendations, provide the scientific basis by which Nicaragua has established that exports are not detrimental to the survival of the species and are compliant with Article IV, paragraphs 2(a), 3 and 6(a) of the Convention (PC24 Com. 4 (Rev. by Sec)). Recommendations (a) and (b) were deemed to have been implemented at SC74 (SC74 Summary Record), with Nicaragua providing a comprehensive forestry management plan for 2017-2033. Recommendations (c) and (d) are currently considered to be partially implemented (SC77 Summary Record).

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Trade in commodities whose export appears to have been prohibited

While Article 2 of Law No. 585 of June 2006 prohibited the export of roundwood, sawn wood, and timber from natural forests, exports in *D. tucurensis* sawn wood from Nicaragua were recorded in the CITES Trade Database 2015-2022 by both Nicaragua and importers, and exports of logs and timber were recorded by importers only. Further information could be sought from trading partners regarding the commodities traded, in order to understand whether the discrepancies were caused by differences in the commodity definitions used by Parties. In particular, Nicaragua could be requested to clarify whether the definition of sawn wood relevant to national legislation is the same as that defined by CITES.

Discrepancies between harvest and export figures

Discrepancies are apparent between exports as registered by INAFOR's Traceability System 2015-2022 and the CITES MA of Nicaragua's records, and those recorded in the CITES Trade Database. Volumes of direct exports from the CITES Trade Database 2015-2022 appear to have been higher than exported volumes recorded in the other two sources; the reason for these discrepancies is unclear.

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Guibourtia tessmannii: Cameroon, Equatorial Guinea

A. Summary

CRITERIA MET:	Criterion i) trade in an endangered species and criterion v) high volume of trade in a globally threatened species.
GLOBAL STATUS:	Globally Endangered (2020 assessment), with a decreasing population trend, on the basis that the global population is predicted to decline by over 50% over the next 100 years as a result of overharvesting and loss of seed dispersers.
CAMEROON: Responded to the consultation relating to the RST	Distributed throughout Cameroon but the largest stocks occur in the country's South and Littoral regions. No population estimates could be located, however inventory data 2003-2008 indicated an average density of 0.02 trees/ha (DBH ≥ 20 cm), lower than the widely reported average density for the species across its range of 0.05 trees/ha. Cameroon has submitted annual reports for fauna for 2017-2022, but not yet for flora. All trade in *G. tessmannii* has therefore been reported by importers only: direct exports from Cameroon 2017-2022 mostly comprised 6177 m^3 sawn wood and 451 m^3 logs wild-sourced for commercial purposes, with the remainder of trade in pre-Convention commodities. Cameroon has published genus-level CITES export quotas for *Guibourtia* spp. 2019-2023. Based on importer-reported data, direct exports of wild-sourced logs and sawn wood from all *Guibourtia* spp. appear to have exceeded the quota published for 2020. Cameroon indicated that *G. tessmannii* is managed collectively with *G. pellegriniana* under the tradename 'pink bubinga'; both species are considered extremely difficult to distinguish in the field. Logging of pink bubinga is permitted only in forest management units (FMUs) and council forests, for which detailed management plans are required; these require a minimum logging cycle of 30 years. Cameroon was reported to require that concessions adopt management parameters that guarantee that 50% of the volume harvested will have been replaced by the start of the next logging cycle (i.e. a 50% recovery rate). Some sources report there to be a minimum density for harvest of 0.05 trees/ha, but it is unclear whether this is enforced. The minimum exploitable diameter (MED) for the species was reported to be 80 cm, although due to the rarity of the species, an MED of 110 cm was being considered. The export of *G. tessmannii* logs has been prohibited since 2018. Cameroon estimated that between 2017-2021, there was a harvest potential of 13 994 m^3 for *G. tessmannii*, for which a harvest quota of 50% was authorised; however, this volume of harvest does not appear to align with export volumes of *G. tessmannii* from Cameroon reported by the Management Authority, which exceeded 22 000 m^3 2017-2021. A conversion rate of 40% was reported to be applied to the harvest volume to calculate the export quota for sawn wood, however information provided by the CITES SA of Cameroon also appeared to imply that conversion rates are calculated on a sawmill-by-sawmill basis.
PROVISIONAL CATEGORY:	Cameroon have set some of the key management parameters needed to underpin a non-detriment finding, including a minimum exploitable diameter, stem density, and recovery rate. However, there is a lack of detail regarding how

	harvestable volumes are calculated by the Scientific Authority, and it is unclear whether the minimum stem density requirement is enforced and sustainable. Furthermore, it is unclear whether the target of adopting management parameters that guarantee only a 50% recovery rate is sustainable in the long term. On this basis, categorised as **Action is needed**. Between 2019-2021 Cameroon published quotas for *Guibourtia* spp. for logs and sawn wood, despite a prohibition on the export of *G. tessmannii* logs in place since 2018. It may be relevant to consider whether genus-level quotas are appropriate in cases where species in the genus are subject to individual restrictions. Quotas for 2022-2023 were additionally not associated with a clear term code; in future, Cameroon could be requested to specify the term codes its CITES export quotas apply to, and to make them species-specific in order to clarify their scope. Non-submission of annual reports for flora is a concern identified that is unrelated to the implementation of Article IV; it may be relevant to consider referral of Cameroon to the Standing Committee on this matter, noting that this issue was previously discussed at SC74.
EQUATORIAL GUINEA: Responded to the consultation relating to the RST	Distributed throughout Equatorial Guinea, with the average population density estimated at 0.077 trees/ha and a national population size estimated at 102 795 trees (DBH ≥ 110 cm), based on results from Equatorial Guinea's national forest inventory (sample size n = 10 trees of DBH ≥110 cm in 130 plots of 1ha). Equatorial Guinea has submitted annual reports for all years 2017-2022. Direct exports 2017-2022 according to Equatorial Guinea comprised 5205 m^3 of wild-sourced timber; importers reported the export of 12 123 m^3 of wild-sourced logs and 36 552 m^3 of wild-sourced sawn wood over the same period. Equatorial Guinea published its first export quota for *G. tessmannii* in 2023, for 3000 m^3 'wild'. Harvest of *G. tessmannii* required special ministerial authorization and export of the species in roundwood or sawn form was entirely prohibited under Equatorial Guinea's national legislation from 1997-2020; this prohibition was lifted in late 2020, when the harvest and export of *G. tessmannii* by the State was authorised by Decree. According to importer-reported data in the CITES Trade Database, exports of wild-sourced *G. tessmannii* appear to have occurred during the national ban. While management plans are a legal requirement for companies logging in forest concessions, concerns have been raised that these plans do not contain detailed information and are not effectively implemented on the ground. The minimum exploitable diameter (MED) for the species appears to be 70 cm. No information was found regarding a minimum recovery rate, minimum density for exploitation, or the parameters used to determine an annual quota for exploitation of the species.
PROVISIONAL CATEGORY:	The basis for the non-detriment findings for export of wild *G. tessmannii*, as well as the technical basis for the new export quota for 2023 (3000 m^3), is unknown; therefore categorised as **Action is needed**. No term was specified for Equatorial Guinea's 2023 quota; in future, the country could be requested to specify the relevant term code(s) in published quotas in order to clarify their scope.

B. RST background

PC26 marked the first time that *Guibourtia tessmannii* has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Taxonomic note: The genus *Guibourtia* is currently considered to comprise 15 species: 13 occur in tropical Africa, and two in the Neotropics (Royal Botanic Gardens Kew, 2023). Three of these species are currently listed in the CITES Appendices: *G. tessmannii*, *G. pellegriniana*, and *G. demeusei*. The trade name 'bubinga' is commonly used to refer to all three species (CoP17 Prop. 56). Additionally, several local names are used to refer to *G. tessmannii* and *G. pellegriniana* specifically: 'bubinga rose'/'pink bubinga' or 'essingang' are used in Cameroon, and 'oveng' is used in Equatorial Guinea (CoP17 Prop. 56). While *G. tessmannii* and *G. pellegriniana* are genetically distinct (Tosso *et al.*, 2018), these species show high morphological similarity and are considered extremely difficult to distinguish (Barstow *et al.*, 2021; CoP17 Prop. 56). Accordingly, the IUCN Red List assessment for *G. tessmannii* noted that separating information on the population status and trade of *G. tessmannii* and *G. pellegriniana* was challenging, and that studies were needed to develop criteria to distinguish the two species (Barstow *et al.*, 2021).

In this report, the information cited refers to *G. tessmannii* only unless otherwise specified. Literature that uses the common name 'bubinga' was assumed to refer to *G. tessmannii*, *G. pellegriniana*, and *G. demeusei*.

Biology: *G. tessmannii* is a tropical hardwood, reaching up to 40-60 m in height and 2 m in diameter (Meunier *et al.*, 2015; Oteng-Amoako, 2012). Due to its reddish-brown heartwood (Oteng-Amoako, 2012), *Guibourtia* (including *G. tessmannii*) is sometimes referred to as a redwood, rosewood or 'hongmu' (Weng & Putzel, 2017). It is a non-gregarious species (Meunier *et al.*, 2015) that is found scattered within primary evergreen rainforest (Meunier *et al.*, 2015; Oteng-Amoako, 2012) on well-drained soils (Oteng-Amoako, 2012). Doucet (2003) and Meunier *et al.*, (2015) considered the species to have intermediate light requirements. *G. tessmannii* is hermaphroditic; its seeds, pods encased in red aril (Meunier *et al.*, 2015), are thought to be dispersed primarily by mammals and birds (Tosso *et al.*, 2018). The species' pollinator is unknown (De Moura *et al.* 2024), but Tosso *et al.* (2015) speculated that African species of *Guibourtia* were likely pollinated by Apidae spp.

G. tessmannii has generally been reported to fruit during the rainy season, the timing of which varies across its range (Iponga *et al.*, 2020). Based on four observations, minimum diameter at fertility for *G. tessmannii* was estimated to be 37 cm (Doucet, 2003).

Annual growth in trunk diameter of *G. tessmannii* in Gabon was reported to be 0.35 cm per year in natural habitat (Picard and Gourlet-Fleury, 2012 in: CoP17 Prop. 56). In Cameroon, management plans use an assumed growth rate of 0.45 cm per year for the species (Betti, 2012; CITES SA of Cameroon, 2023; Iponga *et al.*, 2020). In Equatorial Guinea, annual growth in diameter was reported to be 0.40 cm per year for "large exploitable trees" (SA of Equatorial Guinea *in litt* to UNEP-WCMC, 2023).

Information on the regeneration capacity of *G. tessmannii* was reported to be lacking (MIDOKO IPONGA *et al.*, 2019; Tosso *et al.*, 2018), but it was assumed to be low on the basis of its low population density and declines of species that are believed to be important seed dispersers (CoP17 Prop. 56).

Distribution: *G. tessmannii* occurs in the westernmost rainforests of Central Africa (CoP17 Prop. 56), with confirmed occurrence in Cameroon, Equatorial Guinea, and Gabon (Barstow *et al.*, 2021) (Figure 3.1). The species was categorised as 'possibly extant' in Congo and Nigeria in its 2021 IUCN assessment (Barstow *et al.*, 2021), while the 2017 CoP proposal for *Guibourtia* spp. noted the "probable presence" of *G. tessmannii* in parts of the Congo and Central African Republic, and considered that it was "highly likely" to occur in southern Nigeria (CoP17 Prop. 56). The estimated extent of occurrence of *G. tessmannii* across Cameroon, Equatorial Guinea and Gabon was estimated to be "at least" 265 847 km^2 (Barstow *et al.*, 2021).

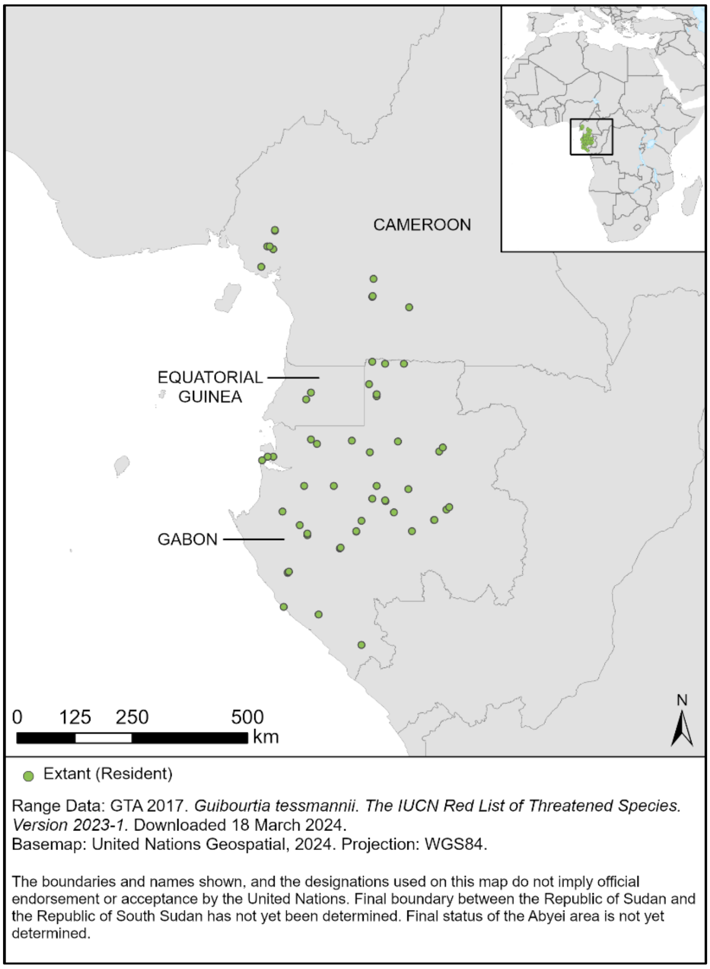

Figure 3.1: Range of *G. tessmannii*.

Population status and trends: *G. tessmannii* was categorised as globally Endangered in a 2021 IUCN Red List assessment, with a population decline of 50% predicted over the next 100 years due to illegal harvest and loss of seed dispersing species such as birds and mammals (Barstow *et al.*, 2021). Harvest for commercial trade was considered to have resulted in "negative impacts" on *Guibourtia* species, particularly between 1990 and 2010 (CoP17 Prop. 56). No global population estimate for the species is available.

G. tessmannii was reported to occur at low densities (Tosso *et al.*, 2015), generally under 0.05 trees/ha (CoP17 Prop. 56). Higher *G. tessmannii* densities have been reported in forest management plans from Gabon and Cameroon, varying between 0.035 and 0.231 stems/ha and 0.001 to 0.12 stems/ha for individuals with DBH ≥20 cm (Doucet pers. comm. in: Tosso *et al.* 2015). Due to these low densities, Tosso *et al.* (2015) noted that population structure was difficult to estimate for *Guibourtia* species.

Threats: *G. tessmannii* is considered to be primarily under threat due to overexploitation for its highly valued pink or reddish timber (Barstow *et al.*, 2021), which is used in premium-grade furniture, musical instruments, flooring and joinery, and handicrafts (Oteng-Amoako, 2012). Both legal and illegal harvest has increased since the mid-1980s due to growing demand for rosewood globally and declines of other rosewood producing species such as *Dalbergia* and *Pterocarpus* (Hills *et al.*, 2022), and large export volumes of *Guibourtia* were reported to have led to a substantial reduction in these species across their range (CoP17 Prop. 56). In particular, rapid growth in demand has been reported from Asia (Barstow *et al.*, 2021), with China representing a key destination market (Weng and Putzel, 2017; see *Trade* sections below). Illegal logging was noted to occur throughout the species' range (MIDOKO IPONGA *et al.*, 2019; Tosso *et al.*, 2015).

Guibourtia species are also threatened by habitat loss driven by conversion of land for agriculture (Betti, 2012); based on monitoring data from FAO 2015-2020, over 500 000 hectares of forest was estimated to have been lost from the Central African region each year (CAFI, 2022). *G. tessmannii* in particular may also be threatened by the declines of important seed dispersers, such as monkeys and hornbills, due to overhunting (Barstow *et al.*, 2021).

Overview of trade and management: *G. tessmannii* was listed in CITES Appendix II on 2 January 2017 with annotation CoP17 #15; the listing currently carries annotation CoP18 #15[10]. According to the CITES Trade Database, global direct trade in *G. tessmannii* 2017-2022 predominantly comprised 53 071 m^3 of pre-Convention sawn wood traded for commercial purposes as reported by exporters; importers reported 88 788 m^3 of sawn wood, with 53% reported as wild-sourced and 46% as pre-Convention. Other notable direct trade included 5205 m^3 of wild-sourced timber reported by exporters and 20 798 m^3 of logs reported by importers (84% wild-sourced with the remainder pre-Convention) traded for commercial purposes. Based on importer-reported data, over 99% of sawn wood came from three range States: Gabon (49%), Equatorial Guinea (42%), and Cameroon (9%). Notable levels of direct trade in seized/confiscated specimens (source 'I') from Gabon were also reported, including 550 797 kg of wood products reported by the importer (China) in 2020 as well as 6216 m^3 of transformed wood reported by Gabon 2020-2022. Small amounts of direct trade were reported at the genus level, which mainly consisted of 32 m^3 of wild-sourced sawn wood and 49 wood products reported by importers for commercial purposes.

Noting the high morphological similarity between *G. tessmannii* and *G. pellegriniana* (see *Taxonomic note* above), Iponga *et al.* (2020) reported that economic operators, forest concessionaires and other forestry stakeholders had extreme difficulty in distinguishing these species in the field, but noted the availability of literature that describes the visual differences between them (e.g. Tosso *et al.*, 2015). Once cut, while the anatomy of wood differs between *G. tessmannii* and *G. pellegriniana* (Bamford, 2005), these differences are considered extremely subtle (CoP17 Inf. 77). As such, *G. tessmannii* and *G. pellegriniana* have been described as indistinguishable in trade, while *G. demeusei* has been described as distinguishable but easily confused with the two other species (TRAFFIC, 2016).

[10] CoP18 annotation #15 includes all parts and derivatives, except: a) Leaves, flowers, pollen, fruits, and seeds; b) Finished products to a maximum weight of wood of the listed species of up to 10 kg per shipment; c) Finished musical instruments, finished musical instrument parts and finished musical instrument accessories; d) Parts and derivatives of *Dalbergia cochinchinensis*, which are covered by Annotation # 4; and e) Parts and derivatives of *Dalbergia* spp. originating and exported from Mexico, which are covered by Annotation # 6.

D. Country reviews

Cameroon

Distribution: *G. tessmannii* was reported to be mostly restricted to Cameroon's South and Littoral Regions (Betti, 2012), with southern Cameroon thought to host the largest stocks of "bubinga" (Betti pers. comm. 2012 in: Weng and Putzel, 2017). However, forest management inventories also indicate the presence of the species in central, eastern and western Cameroon (CoP17 Prop. 56).

Population status and trends: No national population estimates were located. Based on 2003-2008 inventory data from 39 Forest Management Units (FMUs) and council forests in Cameroon's permanent forest domain (see *Management* section), the average density of 'pink bubinga' (*G. tessmannii* and *G. pellegriniana*) ≥ 20 cm diameter was estimated at 0.02 trees/ha[11], which was considered low compared to the widely reported average density of 0.05 trees/ha for *G. tessmannii* across its global range (Betti, 2017 in: CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023). The lowest densities have been reported in the east of Cameroon, towards the edge of the species' range (CoP17 Prop. 56).

The CITES SA of Cameroon (*in litt.* to UNEP-WCMC, 2023) noted that the species appears to have good regeneration in FMUs and council forests, based on diameter class data assumed to be derived from the 2003-2008 inventory data mentioned above (Figure 3.2). However, CoP17 Prop. 56 raised concerns about using low densities of *G. tessmannii* recorded in forest concessions to calculate the population structure of the species at a larger scale. Furthermore, the diameter class distribution curves included within management plans of FMUs in Cameroon were described in CoP17 Prop. 56 as "consistently unfavourable" except for one FMU. Earlier work by Betti (2012) analysed 12 FMU management plans in Cameroon and concluded that all diameter classes were not well represented.

[11] Reported densities for individual forestry concessions ranged from 0.001 to 0.221 trees/ha (≥ 20 cm).

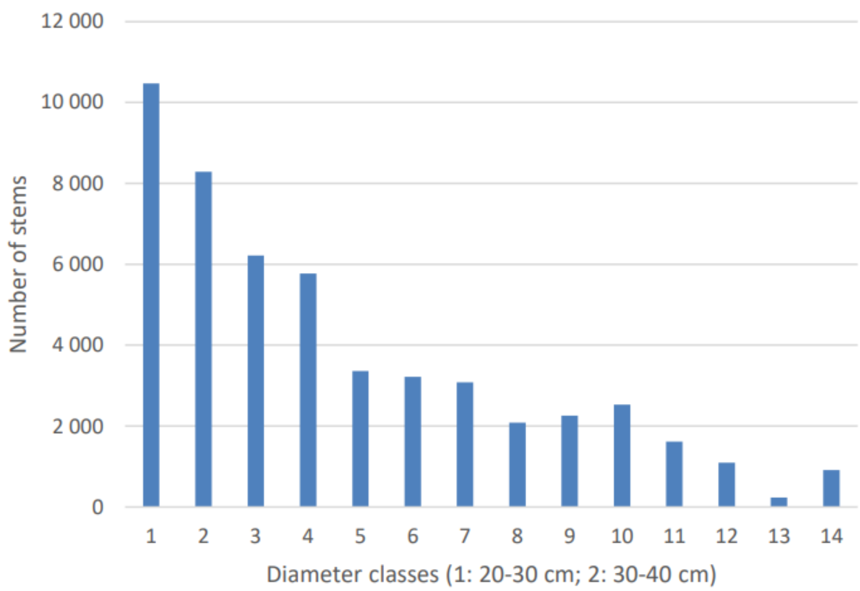

Figure 3.2: Stand structure of *G. tessmannii* in production forests in Cameroon, assumed to have been calculated from 2003-2008 inventory data from 39 FMUs and council forests in Cameroon's permanent forest domain. Source: Betti (2017) in CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023.

Threats: *G. tessmannii*, along with *G. pellegriniana* and *G. demeusei*, were noted to be the main *Guibourtia* species targeted by logging in Cameroon (CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023). Increasing demand for 'hongmu' (redwood) to supply markets in China has reportedly increased the pressure on bubinga species in the country (CoP17 Prop. 56; Weng and Putzel, 2017), with exports of *Guibourtia* from Cameroon to China noted to have begun "around 2010" (Weng & Putzel, 2017).

Bubinga timber is also utilised domestically, accounting for approximately 90% of wood used in the production of furniture in Ebolowa (South Region) (CITES SA of Cameroon *in litt.* to UNEP-WCMC, 2023). Since 2012, the availability of bubinga wood for domestic use in Cameroon was noted to have significantly decreased, with harvested wood preferentially exported to the more valuable international market (CoP17 Prop. 56). *G. tessmannii* was also reported to be highly valued in some communities for its medicinal, spiritual and religious value (Betti, 2012; Oteng-Amoako, 2012; Parren *et al.*, 2001), but information on potential impacts of domestic use, or whether this value provides protection to the species, could not be located.

The CITES SA of Cameroon (*in litt* to UNEP-WCMC, 2023) considered the main threats to the *Guibourtia* genus to be habitat loss (particularly from agricultural expansion) and illegal logging.

Trade: Cameroon has submitted annual reports for all years 2012-2022, however the annual reports for 2017-2021 did not include data on flora exports[12]. As a result, exporter-reported data for *G. tessmannii* for these years are not available and all CITES trade statistics are according to importers.

[12] At SC74 in March 2022, the Secretariat reported that it had requested the Management Authority of Cameroon to submit missing information on flora exports for the years 2009, 2011, 2017, 2018, 2019 and 2020. At the time, while Cameroon had indicated that exports of CITES-listed flora species consisted of *Pericopis elata*, *Guibourtia demeusei* and *Prunus africana* only, the reports provided to the Secretariat were considered to be incomplete, and Cameroon was not deemed to have provided the requested information (SC74 Doc. 28.1).

Cameroon has published annual CITES export quotas at the genus level for *Guibourtia* spp. 2019-2023; these quotas were for logs and sawn wood for the years 2019-2021, but for all wild-sourced specimens for commercial purposes in 2022 and for all specimens in 2023 (Table 3.1). The CITES MA of Cameroon (*in litt.* to UNEP-WCMC, 2024) also summarized its export quotas for the years 2017-2021, some of which differed from those published on the CITES website: 6872.65 m^3 (2017), 5493.55 m^3 (2018), 5817.67 m^3 (2019), 4304.74 m^3 (2020) and 4180.023 m^3 (2021). The type of commodity (e.g. timber, logs, sawn wood) was not specified. Direct exports of wild-sourced logs and sawn wood as reported by importers appeared to have exceeded the genus-level quota in 2020; 63% of this trade was in *G. demeusei* and the remainder was reported as *G. tessmannii*.

According to the CITES Trade Database, importer-reported direct trade in *G. tessmannii* from Cameroon 2017-2022 mostly comprised wild-sourced sawn wood (6177 m^3) and logs (451 m^3), as well as pre-Convention sawn wood (1824 m^3) and logs (317 m^3), all traded for commercial purposes (Table 3.2). Direct trade in wild-sourced logs and sawn wood from Cameroon peaked in 2020 with a total of 3348 m^3 of sawn wood and 312 m^3 of logs. China was the sole importer of logs and accounted for the majority (93%) of sawn wood imports. No direct trade from Cameroon was reported at the genus level (*Guibourtia* spp.) by importers.

Indirect trade in *G. tessmannii* originating in Cameroon as reported by re-exporters included 28 038 pre-Convention wood products reported by number, the majority of which were re-exported by Indonesia in 2017 (Table 3.3). Wild-sourced re-exports of *G. tessmannii* consisted of 23 carvings reported by number and 44 m^3 of sawn wood, as reported by re-exporters.

Table 3.1: CITES export quotas published at the genus level for *Guibourtia* spp. from Cameroon 2017-2024, and global direct exports of wild-sourced logs and sawn wood for all *Guibourtia* spp. as reported by Cameroon and importers, 2017-2022. The quotas for 2017-2021 are for logs and sawn wood, while the quotas for 2022 and 2023 were published for “all”. Hyphens indicate years where quotas were not published, or where exporter CITES annual reports for flora have not been received; trade data for 2023 and 2024 are not yet available. Trade quantities have been rounded to whole numbers, where applicable. Apparent quota excesses are indicated by **bolded** quantities.

Wild	2017	2018	2019	2020	2021	2022[13]	2023[14]	2024
Quota (m^3)	-	-	5817	4307.73	5738.2	6151.59	5333.01	-
Reported by exporter	-	-	-	-	-	-	-	-
Reported by importer	41	746	3295	**9823**	4711	4823	-	-

[13] Quota for 2022 was published for ‘All. Wild specimens for commercial purposes’; trade quantities are based on all wild-sourced trade terms for commercial purposes reported by cubic metre.
[14] Quota for 2023 was published for ‘All’; trade data are not yet available.

Table 3.2: Direct exports of *G. tessmannii* from Cameroon, 2017-2022. Quantities have been rounded to the nearest whole number, where applicable. Hyphens indicate years where exporter CITES annual reports for flora have not been received.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	m^3	T	O	Exporter	-	-	-	-	-	-	-
				Importer		4					4
logs	m^3	T	O	Exporter	-	-	-	-	-	-	-
				Importer	317						317
			W	Exporter	-	-	-	-	-	-	-
				Importer		139		312			451
sawn wood	m^3	T	O	Exporter	-	-	-	-	-	-	-
				Importer	1747	77					1824
			W	Exporter	-	-	-	-	-	-	-
				Importer	41	436	884	3348	747	720	6177
timber	m^3	T	O	Exporter	-	-	-	-	-	-	-
				Importer	25						25

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 3.3: Indirect trade in *G. tessmannii* originating in Cameroon, 2017-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable.

.Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
carvings	kg	T	O	Exporter	3						3
				Importer							
	m^3	T	O	Exporter		0.002					0.002
				Importer	1	0.04					1
	number of specimens	T	O	Exporter	2	59	40				101
				Importer	1401	24					1425
			W	Exporter		23					23
				Importer							
derivatives	m^3	T	O	Exporter							
				Importer		0.004					0.004
sawn wood	m^3	T	O	Exporter	13	3	15	4			35
				Importer							
			U	Exporter							
				Importer	5						5
			W	Exporter					20	24	44
				Importer							
	number of specimens	T	O	Exporter		47					47
				Importer							
wood product	kg	T	O	Exporter		5	2				7
				Importer			1				1
	m^3	T	A	Exporter					0.007		0.007
				Importer							
			O	Exporter	0.2	0.2					0.4
				Importer	0.8	0.1	0.006				0.97
	number of specimens	T	A	Exporter							
				Importer	5						5
			O	Exporter	28000	38	1				2803 8
				Importer	4270	990	5				5265
			W	Exporter							
				Importer		23					23

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Data received *in litt.* to UNEP-WCMC from the CITES MA of Cameroon: In response to the request for information from UNEP-WCMC, Cameroon provided data on exports of 'bubinga' for the years 2017-2021; it is unclear whether these statistics distinguish between *G. tessmannii*, *G. pellegriniana* and *G. demeusei* (the three main logged species in Cameroon; see *Threats*). The type of commodity (e.g. timber, logs, sawn wood) was also not specified. According to these data, export permits issued for bubinga 2017-2021 totalled ~22 406 m^3 (Table 3.4). However, a separate report also provided by the CITES MA of Cameroon (*in litt.* to UNEP-WCMC, 2023) stated that for the period 2017-2021, "the Scientific Authority has approved a harvest quota of 6644 m^3".

Table 3.4: Export permit volumes issued for bubinga 2017-2021 as provided by the CITES MA of Cameroon (*in litt.* to UNEP-WCMC, 2023). The type of commodity was not specified.

	2017	2018	2019	2020	2021	Total
Volume (m^3)	5641.78	5321.326	5618.918[15]	3605.208	2218.644	22 405.876

Management:

Legislation:

Forest classifications: Cameroon's Forestry Law of 1994 (Law No. 94-01/1994) divides its forests into 1) the permanent forest domain (itself comprising State forests, which include production forests and protected forests, and council forests) and 2) the non-permanent forest domain (national forests other than those designated in the permanent forest domain, community forests, and forests belonging to private individuals)[16] (Table 3.5). Production forests are usually divided into forest management units (FMUs) that are generally managed by private entities, and represent the main source of commercial timber in Cameroon (Preferred by Nature, 2021a). The logging of bubinga was reported to have been restricted to FMUs and council forests since 2015 (CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023).

While non-permanent forests require "simple management plans" (Law No. 94-01/1994), FMUs require detailed management plans (Article 41 of Law 94-01/1994) that are in accordance with forest management guidelines detailed within Order No. 222 of 25 May 2001 (see *Requirements for detailed forest management plans* below).

[15] While the CITES MA of Cameroon (*in litt.* to UNEP-WCMC, 2024) noted that 5618.918 m^3 'bubinga' was approved for export in 2019, the sum of the individual export permits issued at the concession level included in the same report totalled 5709.919 m^3.

[16] In PC26 Inf. 5, Cameroon reported that 8 740 404 hectares (~40% of the national forest area) was allocated to production forests, and 2 938 825 hectares (~14% of national forest area) was allocated for conservation. The remaining area was reported to be unallocated forest, and included non-permanent forest domains that are not used for forestry activities (PC26 Inf. 5). As of 2023, according to Cameroon's Ministry of Forestry and Wildlife, there were 121 FMUs in Cameroon over an area of approximately 6.5 million hectares (MINFOF, 2023).

Table 3.5: Summary of the division of Cameroon's forest estate, based on Law No. 94-01/1994, Preferred by Nature (2021a), and Timber Trade Portal (2023).

Permanent domain	Non-permanent domain
State Forests (forêts domaniales): includes production forests that are typically divided into forest management units (FMUs) and protected forests. Detailed management plans are required.	National forests (forêts du domaine national): national forests other than those in the permanent domain. A harvest inventory and annual operations plan is required.
Council Forests (forêts communales): forests that are privately owned by local authorities (councils). Detailed management plans are required.	Community forests (forêts communautaires): forests that are allocated to communities by the State. Simple management plans are required.
	Private forests (forêts des particuliers): privately owned forests. Simple management plans are required.

Prohibitions: The export of bubinga from Cameroon was previously suspended on 20 April 2011 as a precautionary measure due to overexploitation, with exceptions granted for forest concessions, council forests and logging sales ('ventes de coupe'[17]) that met certain requirements (Decision No.0354/2011). A harvest suspension, this time with exceptions only for holders of valid logging permits, was introduced on 9 November 2012, until the process of the inclusion of the species in the CITES Appendices was completed (Order No. 2401/2012). The export of 'pink bubinga' (*G. tessmannii* and *G. pellegriniana*) logs was prohibited by Order No. 21 of 19 February 2018; however, Cameroon has published CITES export quotas for *Guibourtia* spp. 'logs and sawn wood' 2019-2021, and for 'All' in 2022 and 2023 (see *Trade* section).

Cameroon's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Requirements for detailed forest management plans: Both forest types from which logging of bubinga is currently permitted (FMUs and council forests) require detailed management plans to be in place. A summary of the requirements for these plans can be found below:

Cutting cycles and recovery rates: Requirements for forest management in production forests are detailed in Order No. 222 of 25 May 2001, and include a minimum logging cycle of 30 years and the obligation to conduct an inventory. Cerutti *et al.* (2011) reported that the minimum legal recovery rate[18], defined as the "ratio of timber that must be available for logging during the next rotation at a given minimum cutting diameter", is set at 50% of the initial stock. This means that the logging company must adopt management parameters that guarantee that 50% of the volume harvested will have been replaced by the start of the next logging cycle (Cerutti *et al.*, 2011), and that, after one logging cycle, the population in the management unit above the Minimum Exploitable Diameter (MED) will have been reduced by 50%. The assumed annual rate of increase in the diameter of *G. tessmannii* used in management plans in

[17] short-term, volume-based logging permits typically zoned within the non-permanent forest domain (ATIBT, 2024)
[18] also known as regeneration rate, or reconstitution rate

Cameroon was reported to be 0.45 cm per year and natural mortality is set at 1% per year (CITES MA of Cameroon *in litt.* to UNEP-WCMC, 2023).

Minimum density: Betti (2012) noted that the Dimako Integrated Pilot Development project recommended a minimum density for exploitability of 0.05 trees/ha; while it has been reported that this is the minimum density required for management plans (Betti, 2012), this does not appear to be a legal requirement within Order No. 222/2001. Some FMUs and council forests with densities of <0.05 trees/ha were also included in an analysis of forest titles that appear to be considered exploitable by the CITES SA of Cameroon (*in litt* to UNEP-WCMC, 2023).

Minimum Exploitable Diameter (MED): Decision No. 0546/2016 sets an MED for *G. tessmannii* of 80 cm, with an acceptable interval of 80-89.9 cm. The CITES SA of Cameroon (*in litt* to UNEP-WCMC, 2023) additionally reported that the MED set by forestry managers cannot exceed MED + 30 cm. According to the Ministerial Order setting out the provisions for forestry management plans, trees that exceed MED + 40 cm are removed from the population statistics used to calculate the harvest potential and are inventoried to identify seed trees which cannot be harvested (Arrêté Ministériel 0222/A/MINEF du 25 Mai 2001).

The CITES SA of Cameroon (*in litt* to UNEP-WCMC, 2023) noted that the ultimate MED to be applied (80-120 cm) was determined based on a calculation of the projected recovery rate under different MED scenarios; the MED is increased until a minimum recovery rate of 50% is projected under a given harvest level. Tosso *et al.* (2015) reported that if sufficient recovery has not been achieved after the first rotation, the MED has to be increased by the operator.

Tosso *et al.* (2015) remarked that the MEDs set for *Guibourtia* spp. in Central and West Africa “are generally not established on a scientific basis” and suggested that fruiting diameters should also be taken into account to ensure that seed production is maintained. The CITES MA of Cameroon (*in litt* to UNEP-WCMC, 2023) indicated that, due to the rarity of the species, a 110 cm MED for *G. tessmannii* was being considered.

Harvest and export quotas: Information received from the MA and SA of Cameroon (*in litt.* to UNEP-WCMC, 2023) appears to indicate that harvest and export of *G. tessmannii* is managed together with *G. pellegriniana* as ‘pink bubinga’.

The CITES MA of Cameroon (*in litt.* to UNEP-WCMC, 2023) reported that separate national quotas are set for the harvesting and processing of bubinga, with these national quotas based on individual quotas that are allocated to specific forest titles and processing facilities. Within this system, only forest titles that are identified as having a processing partner are permitted to harvest bubinga; similarly, only those processing facilities linked to an approved supplier of bubinga logs can be allocated a quota for processed wood (CITES MA of Cameroon *in litt* to UNEP-WCMC, 2023).

Each FMU is split into sub-areas known as an “annual allowable cut” (Timber Trade Portal, 2023), which comprises the area intended to be harvested in a given year (SC77 Doc. 33.4). The total annual harvest quota for an FMU described by the CITES SA of Cameroon (*in litt* to UNEP-WCMC, 2023) appears to be the sum of the harvest quota in the new annual allowable cut (AAC, ‘assiette annual de coupe’) for the upcoming year, plus any unused harvest quota from the AAC for the current year. There are two broad steps involved in setting the harvest quota for a new AAC: 1) the calculation of a potential harvest volume, and 2) a calculation to determine what percentage of that volume should be authorised for harvest, based on the advice of the SA. Potential harvest volumes are calculated using a “Tarif de Cubage”; while no specific formula could be located, this was assumed to comprise a calculation of the volume of timber available from trees that are over the MED. The volume that should be authorised for harvest was described to be determined by the SA on the basis of "relevant management plan considerations" and the diameter structure of the species in the AAC (CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023).

The CITES MA of Cameroon (*in litt* to UNEP-WCMC, 2023) estimated that between 2017-2021, the volume of harvestable *G. tessmannii* trees[19] in FMUs and council forests was approximately 13 994 m^3, and reported that the CITES SA of Cameroon approved the harvest of 6644 m^3 *G. tessmannii* over this period. While this appears to be consistent with the export volumes reported in the CITES Trade Database by importers, it should be noted that a breakdown of the harvest and export of bubinga for the years 2017-2021 at the level of forest title provided by the CITES MA of Cameroon (*in litt* to UNEP-WCMC, 2023) indicated that over 22 000 m^3 bubinga was exported from Cameroon 2017-2021 (see *Trade* section). The reason behind this discrepancy is unclear; possibilities include (1) species-specific versus genus-level reporting (the export figures provided by the MA where only given for the common name 'bubinga', and Cameroon is also a range State of *G. demeusei*), or (2) the presence of stockpiles.

A conversion rate of 40% was reported to be applied to the harvest volume to calculate the export quota for sawn wood (the CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023), however information provided by the CITES SA of Cameroon also appeared to imply that conversion rates are calculated on a sawmill-by-sawmill basis.

Protected areas: *G. tessmannii* likely occurs in several protected areas within its range, including in Ebo National Park, Douala Edéa National Park, and Mont Nlonako Wildlife Reserve in the Littoral Region, and in Lobéké National Park in the East Region (Betti, 2012). The species was additionally reported to occur in Mount Cameroon National Park and Campo Ma'an National Park in the South Region, and in the Mungo River Forest Reserve in the South-West Region (Onana J.M. pers. comm in: CITES SA of Cameroon *in litt* to UNEP-WCMC, 2023).

Illegal trade: Following the export ban for bubinga in 2011, Weng and Putzel (2017) documented illegal trade in bubinga from southern Cameroon to China; interviews with informants involved in this trade reported the falsification of paperwork, laundering of illegally harvested timber (e.g. mixing with legally sourced timber), and concealment of bubinga in shipments of other species. Reports of bubinga species being declared under other species names (e.g. *Triplochiton scleroxylon*) in Cameroon have also been noted by other authors (Bikoi Binam & Sipehouo Metchebong, 2012).

Equatorial Guinea

Distribution: *G. tessmannii* is distributed throughout continental Equatorial Guinea (CITES MA of Equatorial Guinea *in litt*. to UNEP-WCMC, 2023; CoP17 Prop. 56) but does not occur naturally in the country's Insular Region, which comprises the islands of Bioko and Annobón (CITES MA of Equatorial Guinea *in litt*. to UNEP-WCMC, 2023).

Population status and trends: Based on results from Equatorial Guinea's ongoing national forest inventory, the population size of *G. tessmannii* in the forests of continental Equatorial Guinea (est. 1 335 000 hectares) was estimated at 102 795 trees (DBH ≥ 110cm) (CITES MA of Equatorial Guinea *in litt*. to UNEP-WCMC, 2023). Population density was estimated at 0.077 trees/ha, based on a total of

[19] Potential harvest was determined by the CITES SA of Cameroon on the basis of relevant management plans and the distribution of diameter size classes of bubinga stocks; no further details on the methodology was provided (CITES MA of Cameroon, *in litt*. to UNEP-WCMC, 2023).

ten *G. tessmannii* trees (> 110 cm DBH) found "in and around forest inventory plots" spanning a total of 130 hectares[20] (0.01% sampling rate; Figure 3.3, Table 3.6). The overall population estimate of 102 795 individuals was calculated by multiplying the above density estimate by the area of Equatorial Guinea's 'production forests' (820 000 hectares; 63 140 trees) and 'conservation forests' (515 000 hectares; 39 655 trees) (CITES MA of Equatorial Guinea *in litt.* to UNEP-WCMC, 2023). It was noted that these estimates did not take into account trees below 100 cm DBH (CITES MA of Equatorial Guinea *in litt.* to UNEP-WCMC, 2023).

It should be noted that the report prepared by the CITES MA of Equatorial Guinea in which the population estimates were included used the common name 'bubinga' in conjunction with *G. tessmannii*; it is unclear if the inventory distinguished *G. tessmannii* from other *Guibourtia* species that occur in Equatorial Guinea, which according to De La Estrella *et al.* (2006) include *G. demeusei* and *G. ehie*. It was also acknowledged by the CITES MA of Equatorial Guinea that *Guibourtia tessmannii* and *Guibourtia pellegriniana* are "often confused, all referred to as Bubinga (*Guibourtia tessmannii*)" (CITES MA of Equatorial Guinea *in litt.* to UNEP-WCMC, 2023).

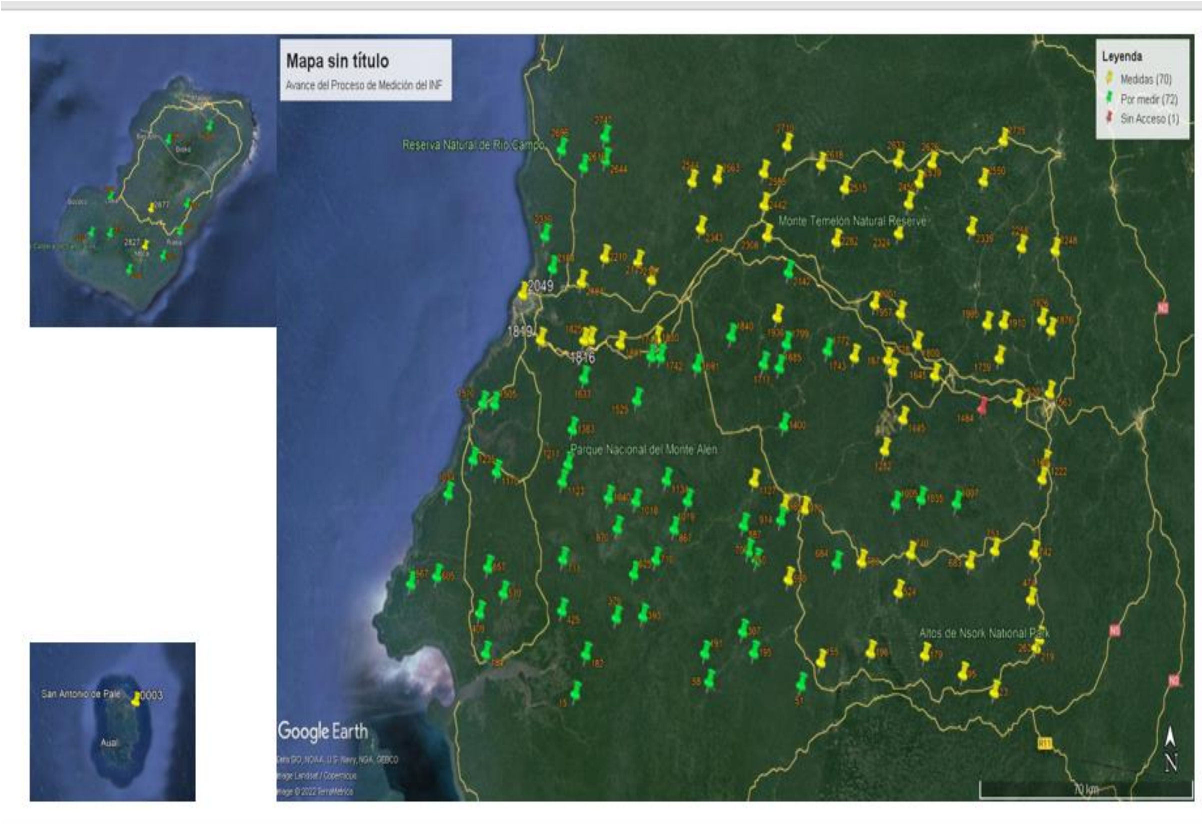

Figure 3.3: The 142 plot locations in Equatorial Guinea's national forest inventory (CITES MA of Equatorial Guinea *in litt.* to UNEP-WCMC, 2023). Each plot measures 100 m^2. Areas where *G. tessmannii* was identified were not indicated on the map (*medidas* = measured; *por medir* = to measure; *sin acceso* = no access). While the map indicates not all 130 sampling units had been sampled, the density estimate provided by the CITES MA of Equatorial Guinea (*in litt.* to UNEP-WCMC, 2023) was for all 130 sampling units.

[20] An additional 12 locations from the Bioko and Annobón Islands (of the Insular Region) were excluded from the density estimate as *G. tessmannii* does not occur naturally in these areas (SA of Equatorial Guinea *in litt.* to UNEP-WCMC, 2023).

Table 3.6: Location of the ten large diameter *G. tessmannii* trees located in 130 sampling units (totalling 130 ha) comprising Equatorial Guinea's National Forest Inventory 2020-2023. Source: CITES MA of Equatorial Guinea, *in litt*. to UNEP-WCMC, 2023.

Population (Town)	Number of trees	Diameter at breast height (DBH)
Mbé Bosque (Evinayong)	1	> 110 cm
Nfaman (Añisok)	1	> 120 cm
Coro Eseng (Niefang)	1	> 150 cm
Oveng Esadon (Añisok)	1	> 125 cm
Bisong (Evinayong)	1	> 135 cm
Esong (Nsork)	1	> 120 cm
Misong-Minvi	4	> 110 cm, > 120 cm, and > 125 cm

Threats: Little information could be found regarding the specific threats facing *G. tessmannii* in Equatorial Guinea, but illegal logging of *G. tessmannii* was considered to be a risk in the country (Preferred by Nature, 2021b).

Trade: Equatorial Guinea has submitted annual reports for all years 2017-2022. Equatorial Guinea published its first export quota for *G. tessmannii* in 2023, for 3000 m^3 wild specimens. As trade data for 2023 are not yet available, it was not possible to assess trade levels against the published quota.

According to the CITES Trade Database, direct exports of *G. tessmannii* from Equatorial Guinea 2017-2022 consisted of 5205 m^3 of wild-sourced timber traded to China for commercial purposes as reported by Equatorial Guinea over the period 2020-2022 (Table 3.7). Direct exports reported by importers comprised 12 123 m^3 of wild-sourced logs and 36 552 m^3 of wild-sourced sawn wood for commercial purposes. China was the sole importer of sawn wood and was also the main importer of logs (87%); Viet Nam (10%) and United Arab Emirates (3%) accounted for the remainder of log imports. Over the six-year period, 2018 represented the highest level of trade, with 27 994 m^3 of sawn wood reported by importers. No direct trade from Equatorial Guinea was reported at the genus level (*Guibourtia* spp.) over this period, either by Equatorial Guinea or importers.

Table 3.7: Direct exports of *G. tessmannii* from Equatorial Guinea, 2017-2022. Quantities have been rounded to the nearest whole number, where applicable.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
logs	m^3	T	W	Exporter							
				Importer			2337	5894	3474	417	12123
sawn wood	m^3	T	W	Exporter							
				Importer		27994	5764	2106	633	54	36552
timber	m^3	T	W	Exporter				2126	2463	616	5205
				Importer							

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Indirect trade in *G. tessmannii* originating in Equatorial Guinea was reported in the years 2020 and 2021 only, and consisted of wild-sourced logs, sawn wood, and timber traded for commercial purposes (Table 3.8). According to re-exporters, trade consisted of 676 m^3 of sawn wood and 119 m^3 of logs and all trade was re-exported via China (55%) and the United Arab Emirates (45%); similar proportions were also reported by importers.

Table 3.8: Indirect trade in *G. tessmannii* originating in Equatorial Guinea, 2017-2022. Quantities have been rounded to whole numbers where applicable.

Term	Unit	Purpose	Source	Reported by	2017	2018	2019	2020	2021	2022	Total
logs	m^3	T	W	Exporter					119		119
				Importer					106		106
sawn wood	m^3	T	W	Exporter				239	437		676
				Importer					240		240
timber	m^3	T	W	Exporter							
				Importer				239	237		476

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: Equatorial Guinea's main national forestry legislation is Law No. 1 of 18 February 1997 and its implementing Decree No. 97 of 12 August 1997. Article 10 of Law No.1/1997 divides Equatorial Guinea's forests into the production domain and the conservation domain, with legal harvest only permitted in the production domain (Preferred by Nature, 2021b). The production domain is divided into privately owned forests, communal forests, and national forests (i.e. forest concessions) (Preferred by Nature, 2021b).

Prohibitions: Exploitation of *G. tessmannii* appears to currently only be legal if carried out by the State. However, the legal situation has changed multiple times over the last five years; key pieces of legislation are outlined below.

Decree No. 97/1997: Article 60 states that due to their artisanal value and rarity, the felling of 'oveng' or 'bubinga' requires special authorization granted by the relevant Ministry, and that the export of these species in roundwood or sawn form is "totally prohibited".

Decree No. 182 of 27 November 2018 (no longer valid): also prohibited the export of roundwood from Equatorial Guinea to encourage the processing of wood within its national territory (Preferred by Nature, 2021b). This Decree came into force 1 January 2019, and was in place until Decree No. 93 of 26 October 2020, which authorised the export of roundwood due to special circumstances (the Covid-19 pandemic).

Decree No. 84 of 15 September 2020: introduced a prohibition on logging throughout Equatorial Guinea's national territory due to "indiscriminate felling of protected trees species such as Oveng and others".

Ministerial Order No. 1 of 30 October 2020, issuing complementary measures for the better application of Decree No. 84: Article 13 specifies that while the exploitation and commercialisation of 'Oveng' is prohibited by the general public, these activities are the "exclusive competence" of the State. The Article further states that the President of the Republic, following a favourable report from the ministry in charge of forests and forest resources (including an updated inventory of the species in the national territory), will decide an annual quota for the exploitation of the species. The CITES MA of Equatorial Guinea (*in litt.* to UNEP-WCMC, 2023) confirmed that the export of *G. tessmannii* roundwood and sawn wood was permitted with government authorization.

Equatorial Guinea's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Management plans and compulsory measures: A management plan is required for logging in national forests, which requires them to be divided into plots with detailed inventories (Decree No. 97/1997). However, Preferred by Nature (2021b) reported that "there are no proper forest management plans implemented in production forests", noting concerns that the information included in such plans was basic, and that management plans were not effectively implemented on the ground.

Article 59 of Decree No. 97/1997 sets the minimum exploitable diameter (MED) for felled trees; *G. tessmannii* appears to correspond to 'category C' (other timber species), for which an MED of 70 cm is specified. Tosso *et al*. (2015) considered that the MEDs set for *Guibourtia* spp. in Central and West Africa "are generally not established on a scientific basis", and suggested that fruiting diameters should also be taken into account to ensure that seed production is maintained.

No information on a minimum recovery rate or minimum density for exploitation was found, nor is it clear what parameters the annual quota for exploitation of the species, as provided for in Ministerial Order No. 1 of October 2020, is calculated from.

Monitoring: A GEF project spanning 2021-2023, *Enhancing Equatorial Guinea's institutional and technical capacity in the agriculture, forestry and other land-use sector for enhanced transparency under the Paris Agreement*, supported Equatorial Guinea's new National Forest Inventory, which will provide an updated assessment of the existing national forest inventory (FAO & GEF, 2023). According to the project implementation report for 2023, 82% of the data collection had been completed, with the data collection phase expected to be completed by the end of 2023 (FAO & GEF, 2023). It is assumed that the population estimates presented above originate from this new updated inventory.

Plantations: The CITES MA of Equatorial Guinea (*in litt* to UNEP-WCMC, 2023) reported that mixed planting trials of *G. tessmannii* with other species (including *Diospyros crassiflora*, *Baillonela toxisperma* and *Aucouma klaineana*) were occurring on the island of Bioko in the Insular Region. As of August 2023, 33 "bubinga (*G. tessmannii*)" were reported to have grown over the past 10 years across 70 hectares, with an average growth rate of 0.033 cm/year (diameter) and 0.28 cm/year (height) (CITES MA of Equatorial Guinea *in litt*. to UNEP-WCMC, 2023). It was not indicated whether these trees were intended for future export.

Protected areas: *G. tessmannii* likely occurs in several protected areas within Equatorial Guinea according to the World Database on Protected Areas, including in Muni Estuary Natural Reserve and Monte Alén National Park.

Illegal trade: Illegal trade in *G. tessmannii*, without permits or with fraudulent permits, has been identified as a risk in Equatorial Guinea (Preferred by Nature, 2021b). Preferred by Nature (2021b) additionally reported "clandestine exploitation" of species including *G. tessmannii* by forestry companies and chainsaw operators, as well as reports of *G. tessmannii* being misdeclared as other species (e.g. *Erytrophleum ivorense*).

In 2019, several containers of kevazingo (*G. tessmannii* and *G. pellegriniana*) were seized in the city of Bata, with the intended destination reported as China (Figaro, 2019).

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Non-submission of annual report data

Cameroon has not yet submitted annual reports for flora for 2017-2022, although the fauna component was received for these years. Non-submission of Cameroon's flora annual reports was previously discussed at the 74th meeting of the Standing Committee (Lyon) (SC74 Summary Record).

Apparent export of prohibited products

- The export of 'pink bubinga' (*G. tessmannii* and *G. pellegriniana*) logs was prohibited in Cameroon by Order No.21 of 19 February 2018; however, China reported the import of 313.3 m^3 of wild-sourced *G. tessmannii* logs from Cameroon in 2020. It is possible these imports represent stockpiles from individuals harvested prior to the introduction of this prohibition.
- Exports of *G. tessmannii* logs and sawnwood from Equatorial Guinea were reported by importers in the CITES Trade Database prior to October 2020, despite export of the species in roundwood or sawn form appearing to have been prohibited at the time.

Issuance of quotas for products whose export appears to have been prohibited

The export of *G. tessmannii* logs from Cameroon has been prohibited since 2018. However, genus-level quotas published on the CITES website between 2019-2021 for *Guibourtia*/Cameroon were for logs and sawn wood, and the quotas for 2022-2023 were published for 'all' specimens (suggesting all trade terms). In future, Cameroon could be requested to specify the relevant term code(s) in the published quotas, in order to clarify their scope.

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Osyris lanceolata: Burundi, Ethiopia, Uganda, United Republic of Tanzania

A. Summary

CRITERIA MET:	Criterion iii) sharp increase in trade from the United Republic of Tanzania and criterion iv) high volume of trade
GLOBAL STATUS:	Globally Least Concern (2017 assessment), with an unknown population trend, on the basis that the global population is assumed to be large and relatively stable.
BURUNDI: Responded to the consultation relating to the RST	*O. lanceolata* has been recorded in the north and east of the country, although it may occur more widely. The population size and conservation status of the species in Burundi is unknown and no comprehensive inventory has taken place. However, the population was considered to have considerably declined as a result of excessive harvest driven by international demand for sandalwood oil. The species has reportedly been fully protected in the country since 2011, although exports have occurred after this date and the species continues to be illegally harvested, including from within protected areas. Burundi has submitted all annual reports to CITES for the period 2013-2022 except for 2018 and 2022, and has not published any CITES export quotas for the species. All direct trade in *O. lanceolata* from Burundi was wild-sourced for commercial purposes and reported in 2015-2017. This trade totalled 102 750 kg of chips and 3500 kg of oil as reported by Burundi, and 300 kg of oil as reported by importers. No trade has been reported since 2017.
PROVISIONAL CATEGORY:	Given a lack of population and monitoring data but a presumed declining population, it is unlikely that Burundi would be able to produce a scientifically robust non-detriment finding for continued trade in *O. lanceolata*. It is unclear if Burundi intends to continue to export the species, but the country noted a need for capacity building to complete a non-detriment finding, therefore categorised as **Action is needed**.
ETHIOPIA: No response received to the consultation relating to the RST	*O. lanceolata* was described as occurring in most Ethiopian regions, but the population size and conservation status of the species in Ethiopia is unknown. Data on stem density and basal area distribution, and an analysis of the proportion for seedlings to saplings to mature trees, were available from only two sites in southern Ethiopia; these were considered to show some evidence of high regeneration but poor recruitment. The areas in which the species was most abundant were all protected, suggesting that harvesting may be having an impact outside of protected areas. The country was noted to possess an industry for essential oil extraction and processing. No information could be located on volumes of *O. lanceolata* processed, or whether the industry primarily deals with *O. lanceolata* harvested from Ethiopia or from other countries. Ethiopia has submitted annual reports for all years 2013-2022 with the exception of 2013, and has not published any CITES export quotas for the species. No direct trade in *O. lanceolata* was reported from Ethiopia until 2022,

	when 1600 kg of wild-sourced oil was exported to India for commercial purposes, as reported by Ethiopia only. An approved management plan is required to exploit productive state or protected forests, but no information could be located regarding whether there are requirements for parameters such as minimum cutting diameters, cutting cycles, or recovery rates.
PROVISIONAL CATEGORY:	There are large information gaps regarding the status of the species and its management in Ethiopia, and it is unclear how a scientifically robust non-detriment finding for trade in *O. lanceolata* in accordance with Article IV has been made, therefore classified as **Action is needed**.
UGANDA: Responded to the consultation relating to the RST	*O. lanceolata* largely occurs in eastern Uganda, with Karamoja sub-region holding the largest populations. The species is thought to have undergone a general decline in the country as a result of overexploitation for export; a 2021 inventory conducted in five eastern Ugandan districts found the standing stock of *O. lanceolata*, as well as levels of recruitment and regeneration, to be too low to sustain commercial production of raw material for sandalwood oil. The authors of the inventory recommended that commercial harvesting of *O. lanceolata* should not take place for another 20 years, to allow for the recovery of Ugandan populations. Uganda has submitted annual reports for all years 2013-2022, and has not published any CITES export quotas for the species. Direct trade in *O. lanceolata* from Uganda 2013-2022 principally comprised wild-sourced powder (16 500 kg) and oil (752 kg) as reported by Uganda, and traded for commercial purposes. Direct exports of 300 kg of wild-sourced timber and 25 kg of wild-sourced extract were reported by importers only. Uganda reported that the harvest, trade and export of *O. lanceolata* is prohibited; the re-export of processed products manufactured with raw material from neighbouring countries is, however, permitted. It is unclear how long such a harvest ban has been in place or whether there is an exception for non-commercial use.
PROVISIONAL CATEGORY:	On the basis that no legal export of wild specimens is anticipated, and conditional upon the annual publication of a zero quota on the CITES website, classified as **Less concern**. Any planned changes to the zero quota should be communicated to the Secretariat and Chair of the Plants Committee for their agreement, along with a justification demonstrating how the change is based on estimates of sustainable offtake using the best available scientific information, for their agreement. Illegal trade remains a concern not related to the implementation of Article IV, with the potential to impact wild populations of *O. lanceolata* in both Uganda and neighbouring countries; a regional approach to address illegal activity appears to be needed.
UNITED REPUBLIC OF TANZANIA: Responded to the consultation relating to the RST	*O. lanceolata* is widespread throughout the United Republic of Tanzania (hereafter Tanzania). The species was heavily exploited in the 1990s and early 2000s, but harvest was banned in 2006 to curb declines, with restrictions on trade reportedly being imposed as early as 1993. Tanzania has submitted annual reports for all years 2013-2022 with the exception of 2021, and has not published any CITES export quotas for the species. Despite the prohibition of *O. lanceolata* harvest, direct exports 2013-

	2022 as reported by Tanzania included 26 790 kg of wild-sourced oil, 24 001 kg of wild-sourced powder, and 525 kg of wild-sourced sawn wood, all for commercial purposes. Importers reported direct trade in wild-sourced powder (24 000 kg), timber (17 500 kg) and oil (1215 kg) for commercial purposes. Tanzania has stated that there is no trade in *O. lanceolata* that is harvested in Tanzanian forests, implying that the reported trade was actually re-exports. In July 2022 Tanzania published a non-detriment finding for *O. lanceolata,* which concluded that there was insufficient quantitative information on the species to justify legal harvest. Although inventories conducted in three areas found the species to be recovering, all individuals surveyed were considered juveniles that had not reached the minimum harvest size. Concerns about ongoing illegal harvest have been raised, although recent studies found no evidence of illegal harvest in parts of the country. Tanzania has 3-4 processing factories for sandalwood, which were reported to source their raw materials mainly from Uganda, Democratic Republic of the Congo, South Sudan and Australia, and which were reported to have exported thousands of kg of sandalwood oil since 2016. Because export data from these factories only indicates that the exports comprise 'sandalwood' it is unclear whether any of these re-export *O. lanceolata*.
PROVISIONAL CATEGORY:	On the basis that harvest and export have been prohibited to allow regeneration of the species, and conditional upon the annual publication of a zero quota on the CITES website, classified as **Less concern**. Any planned changes to the zero quota should be communicated to the Secretariat and Chair of the Plants Committee along with a justification on how the change is based on estimates of sustainable offtake using the best available scientific information, for their agreement. Tanzania are encouraged to improve national reporting for trade in the species, ensuring that any future re-exports are correctly identified.

B. RST background

PC26 marked the first time that *Osyris lanceolata* has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Taxonomic note: Although the CITES listing proposal for *O. lanceolata* considered the species to be monotypic (CoP16 Prop. 69), Groves and Rutherford (2016) stated that the taxonomy of the genus *Osyris* was unclear, and that further discussion was needed "to ensure other species are not included under the name *O. lanceolata*". There is no current accepted standard nomenclatural reference for the genus. CoP16 Prop. 69 lists 13 synonyms for *O. lanceolata*; Kew's Plants of the Worlds Online lists 25 synonyms (including varieties) (Royal Botanic Gardens Kew, 2024).

Biology: *O. lanceolata* is an evergreen, multi-stemmed shrub or small tree (Kamondo et al., 2014; Wilson, 2018). The species attains a height of 1.5-10 m (CoP16 Prop. 69, Giathi et al., 2011; Orwa et al., 2009). It occurs in regions with a warm climate, and has been reported to inhabit a range of habitat types, namely rocky areas, dry forest margins, bushland and grassland, degraded areas and moist woodland (Giathi et al., 2011; Kamondo et al., 2014; Khayota et al., 2019; Wilson, 2018). Across its global range, *O. lanceolata* occurs at elevations of 50-2700 m a.s.l. (Wilson, 2018), although in east and southern Africa the species was reported to occur at elevations of 900-2550 m a.s.l (Orwa et al., 2009).

O. lanceolata is a hemi-parasite, producing chlorophyll for photosynthesis (Orwa et al., 2009) but deriving water and minerals from the root systems of other woody plants to support its development (Kamondo et al., 2014; Mwang'ingo et al., 2005). A study of *O. lanceolata* populations in the southern highlands of the United Republic of Tanzania (hereafter, Tanzania) found that, although the species parasitized a wide range of hosts, its early development was best supported by *Brachystegia spiciformis*, *Casuarina equisetifolia* and *Rhus natalensis* (Mwang'ingo et al., 2005).

O. lanceolata reaches maturity at 15-20 years (>12 cm DBH) (Khayota et al., 2019). Although the species is dioecious, it can regenerate through rootstocks and coppice as well as from seed (Mwang'ingo et al., 2007). A study of *O. lanceolata* in Tanzania 1999-2001 reported that the species mainly relies on vegetative regeneration for recruitment, noting that 61% of the young plants recorded in the study originated from rootstock or coppice and only 39% from seed (Mwang'ingo et al., 2007). Regeneration potential of *O. lanceolata* was reported to be low (National Museums of Kenya, 2019), with "generally poor" seed germination and recalcitrant seeds unable to survive desiccation or freezing (Mbuya *et al.*, 1994 in Teklehaimanot *et al.*, 2004). Mwang'ingo *et al.* (2007) suggested that the species' limited reproductive success was due either to low pollen production or limited pollinator movement, and that poor germination rates were either due to seed recalcitrance or attack by herbivores or pathogens.

Distribution: *O. lanceolata* is globally widespread with a discontinuous range stretching across northern, eastern and southern Africa, as well as central to southeast Asia and parts of southern Europe (Wilson, 2018). In the species' 2017 IUCN Red List assessment, Wilson (2018) estimated its global extent of occurrence to be c. 71 million km^2 (no estimate for area of occupancy was provided). At the local level, populations of *O. lanceolata* were stated to range from "medium to sparsely spread" (CoP16 Prop. 69), and the species was reported to occur at low densities, growing in "sporadic patches" (Giathi et al., 2011) and as "isolated individuals" (Orwa *et al.*, 2009).

Population status and trends: A 2017 IUCN Red List assessment categorised *O. lanceolata* as Least Concern, as the global population was considered to be large and relatively stable with no major threats (Wilson, 2018). Although Wilson (2018) stated that the species' global population size and trend were unknown, the global population was not considered to be severely fragmented or to be undergoing a continuing decline of mature individuals. Within the main production countries for international trade in the species, reported to be Kenya, Tanzania, South Sudan and Uganda, *O. lanceolata* was stated to have become "locally rare" (Groves and Rutherford, 2016).

Threats: Unsustainable harvest of *O. lanceolata* as a source of scented wood (sandalwood) and essential oil was considered to pose the main threat to the species' East African population (CoP16 Prop. 69). Demand for the species from the international perfumery and pharmaceutical industries started to increase in the early 1990s (Masota, 2021; Mbuya et al., 1994 in Teixeira Da Silva et al., 2016) as a substitute for Asian and Australian sandalwood species, as these were becoming less available on the global market (CoP16 Prop. 69). Large-scale commercial exploitation in East Africa has been occurring since 2000, with extraction reportedly being concentrated on communally owned lands and state protected forests (Kioko, 2022). Globally, the market for sandalwood products (including from species other than *O. lanceolata*) is expected to continue to grow over the short- to medium-term (Thomson, 2020).

In East Africa, harvest was noted to target trees of >15 years of age (Khayota et al., 2019) and to typically involve uprooting the entire plant (CoP16 Prop. 69; CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023); the destructive nature of this technique was noted to increase the likelihood of overharvest (CoP16 Prop. 69). Mwang'ingo *et al.* (2007) additionally considered that uprooting could "severely limit the recruitment rate" of harvested populations, given that the majority of reproduction was observed to be from rootstock and coppice.

A study of harvested populations in Tanzania [study date unreported] revealed previous preferential harvest of female trees due to a false perception of higher yield and better-quality oil (Mwang'ingo et al., 2010). The authors cautioned that selective overharvest of females was likely to "erode genetic vigour" and impact sustainability (Mwang'ingo *et al.*, 2010). The impact of unsustainable harvesting was also considered likely to be exacerbated by the species' intrinsic slow growth and poor recruitment rates (CoP16 Prop. 69).

O. lanceolata is also used locally across its East African range for traditional medicine (Teklehaimanot *et al.*, 2004) (Lusweti *et al.*, 2020), livestock fodder (Mwang'ingo *et al.*, 2010), fuelwood, timber and wood carving (National Museums of Kenya, 2019), basketry, and dye for tanning skins (Mbuya *et al.*, 1994 in Teixeira da Silva *et al.*, 2016). Its edible fruits are also consumed in some local communities (Masota, 2021).

Numerous studies have aimed to develop propagation techniques to establish a sustainable source of *O. lanceolata* (Teklehaimanot *et al.*, 2004; Giathi *et al.*, 2011; Admas *et al.*, 2020a, 2020b). However, as of 2019 the species was stated to be harvested mainly from the wild (National Museums of Kenya, 2019) and, at the time of writing, all reported trade in the species has been wild-sourced, according to the CITES Trade Database.

Overview of trade and management: *O. lanceolata* from Burundi, Ethiopia, Kenya, Rwanda, Uganda and Tanzania were listed in CITES Appendix II on 12 June 2013 with annotation CoP16#2[21]; no other populations are included in the CITES Appendices. According to the CITES Trade Database, direct trade in *O. lanceolata* from these countries 2013-2022 predominantly comprised wild-sourced chips (102 750 kg reported by exporters only), oil (32 642 kg reported by exporters and 1515 kg reported by importers) and powder (40 501 kg reported by exporters and 24 000 kg reported by importers). All direct trade was for commercial purposes; of the countries included in the listing, only Burundi, Ethiopia, Uganda and Tanzania reported trade in the species over the 10-year period.

D. Country reviews

Burundi

Distribution: The CITES Management Authority (MA) of Burundi (*in litt.* to UNEP-WCMC, 2023) noted that a comprehensive national inventory of the species has yet to take place. *O. lanceolata* was reported to have been observed in northern and eastern regions of the country (Figure 4.1) (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023), which is consistent with the few reports on species distribution that could be found within the wider scientific literature (Nihorimbere & Ongena, 2018; Mugula et al., 2021); however, this may not provide a comprehensive picture of its distribution in the country. The species was observed in the Kibimbi-Inanzerwe protected landscape in south-eastern Burundi in 2023 (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023).

[21] All parts and derivatives except: a) seeds and pollen; and b) finished products packaged and ready for retail trade.

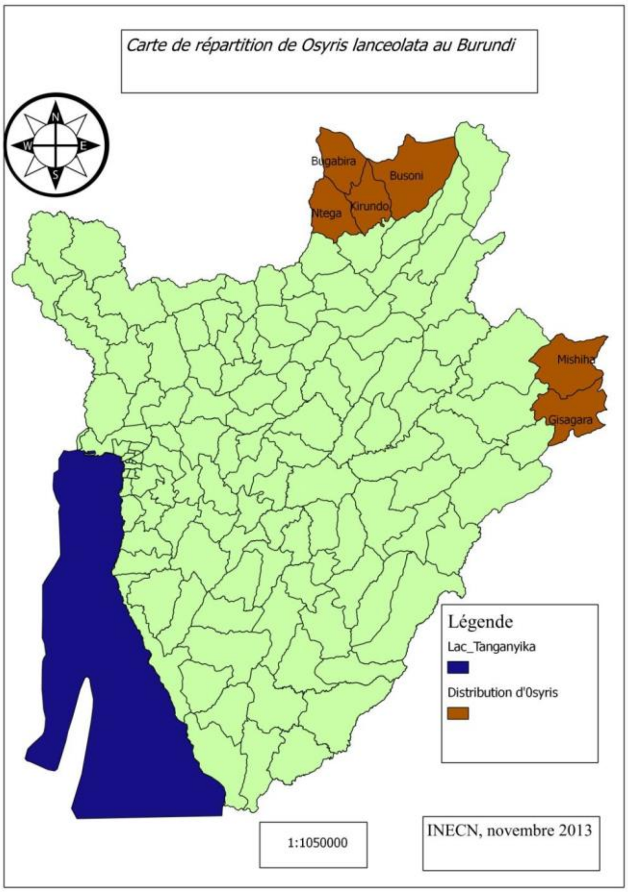

Figure 4.1: Known occurrence of *O. lanceolata* in Burundi. Source: CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023.

Population status and trends: According to the CITES MA of Burundi (*in litt.* to UNEP-WCMC, 2023), the size, status and trends of *O. lanceolata* populations in the country are unknown; however, its population was considered to have considerably declined as a result of excessive harvest that has taken place over the last 10-15 years.

Threats: The CITES MA of Burundi (*in litt.* to UNEP-WCMC, 2023) reported that *O. lanceolata* populations in their country have been subject to high levels of overexploitation, driven by international demand for sandalwood oil. While the species appears to be fully protected (see *Management* section), the Bugesera area in northern Burundi is regarded as a centre of illegal commercial exploitation and cross-border trafficking of the species (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023). Illegal harvest of *O. lanceolata* was first noted to have become an issue in 2010, and levels of illegal harvesting were considered to have increased considerably since this date (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023). The irregular height distribution of trees measured in a protected area in Muhere (northern Burundi) was considered to provide evidence for selective cutting at specific ages, and is consistent with other reports that *O. lanceolata* trees have been harvested (and sometimes uprooted) in protected areas (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023). Domestically, *O. lanceolata* is reported to have few uses in Burundi: surveys conducted in 2013 indicated that the species is used for medicinal purposes, as firewood, and occasionally, as wood for construction (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023).

Trade: Burundi has submitted all annual reports to CITES for the period 2013-2022 except for 2018 and 2022, which had not yet been received at the time of writing. Burundi has not published any CITES export quotas for this species.

Direct trade in *O. lanceolata* from Burundi 2013-2022 comprised wild-sourced chips (102 750 kg reported by Burundi only) and oil (3500 kg reported by Burundi and 300 kg reported by importers)

(Table 4.1). All trade was for commercial purposes and reported for the years 2015-2017; exports as reported by Burundi were considerably higher in 2016 than in other years. Over 98% of the chips reported by Burundi were exported to Tanzania, whereas India and the United Arab Emirates were the importers of oil. No indirect trade in *O. lanceolata* originating in Burundi was reported 2013-2022.

Table 4.1: Direct exports of *O. lanceolata* from Burundi, 2013-2022. Hyphens indicate years where exporter CITES annual reports have not yet been received.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
chips	kg	T	W	Exporter			50	101000	1700	-				-	102750
				Importer											
oil	kg	T	W	Exporter				1800	1700	-				-	3500
				Importer					300						300

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: Protective regulations relevant to *O. lanceolata* were first established in the territory of present-day Burundi in 1923 by law n°29/129, which prohibited the felling of sandalwood trees in forests belonging to the state or indigenous communities without prior authorisation. Law n°1/10 of May 2011 (CITES MA of Burundi *in litt.* to UNEP-WCMC, 2023) banned the cutting, uprooting, transport, buying or selling of all plant species considered to be threatened under international conventions (including *O. lanceolata*) in protected areas. Article 7 of this law also prohibits intentional damage to natural habitats where this species occurs.

Burundi's national legislation is included in Category 2 in the CITES National Legislation Project (legislation that is believed generally to meet one to three of the four requirements for effective implementation of CITES). The most recent legislative status table (updated November 2023) noted that the CITES Secretariat had provided comments on new draft legislation in 2021; enactment of the finalised legislation was expected by the end of 2023.

Exploitation agreements: The CITES MA of Burundi (*in litt* to UNEP-WCMC, 2023) noted that sale of *O. lanceolata* products harvested in Kirundo province had previously occurred using a Memorandum of Understanding (MOU) between the Burundian Office for the Protection of the Environment (OBPE) and an international company based in the United States of America; this agreement no longer appears to be in place.

Illegal trade: While no seizures involving *O. lanceolata* from Burundi were reported in the TRAFFIC Wildlife Trade Portal 2013–2023 (TRAFFIC International, 2023), the CITES MA for Burundi (*in litt.* to UNEP-WCMC, 2023) noted that substantial amounts of illegally harvested *O. lanceolata* (in excess of 30 tonnes) have been seized in the Kirundo region since 2010.

Ethiopia

Note: the majority of literature available on the species in Ethiopia uses its synonym, *O. quadripartita*.

Distribution: Bekele *et al.* (2019) described the species as occurring in "most Ethiopian regions", but no estimates could be located for its area of occupancy in the country.

Population status and trends: It is unclear whether a National Forestry Inventory has taken place, and no data on country-wide status or trends of the species were identified. However, surveys of *O. lanceolata* have been conducted at various sites in southern Ethiopia, including in the Borena and west Guji Zones of the Oromia Region (Bekele *et al*, 2019), and in the South Omo and Gamo Gofa Zones

(Seifu *et al.*, 2018), the Banna-Tsemay and Arba Minch Zuria districts (Erbo *et al.*, 2020), and the Oda forest (Wolaita Zone) in the Southern Nations, Nationalities and Peoples Region (SNNPR) (Kuma & Shibru, 2015). Table 4.2 summarises the findings from each of these studies, which in most cases took place in areas where the species was considered likely to be present.

Table 4.2: Surveys of *O. lanceolata* density conducted in Ethiopia. All plots measured 20 x 20 m (0.04 ha).

Reference	Location	No. plots sampled	Average *O. lanceolata* abundance (range)	Notes
Bekele *et al.* (2019)	Borena Zone (Oromia Region)	22	15 stems/plot (0-32), including saplings (equivalent to 375 stems/ha)	Abundance estimates also include individuals of *O. compressa*. Note that plots were placed in forest patches where *O. lanceolata* presence was suspected. Areas where *O. lanceolata* was noted to be most abundant were all protected
Bekele *et al.* (2019)	West Guji Zone (Oromia Region)	7	10 stems/plot (0-20), including saplings (equivalent to 250 stems/ha)	Abundance estimates also include individuals of *O. compressa*. Note that plots were placed in forest patches where *O. lanceolata* presence was suspected. Areas where *O. lanceolata* was noted to be most abundant were all protected
Seifu *et al.*, (2018)	South Omo Zone (SNNPR)	13	10.6 stems/plot including seedlings and saplings (2-25) (equivalent to 265 stems/ha)	The majority of plots in which *O. lanceolata* was found were noted to be in protected areas
Seifu *et al.*, (2018)	Gamo Gofa Zone (SNNPR)	15	21.1 stems/plot including seedlings and saplings (8-33) (equivalent to 527.5 stems/ha)	
Erbo *et al.*, (2020)	Mayile (Bana Tsemay District, SNNPR)	31	74 stems/ha	Only includes individuals with a DBH ≥ 2.5 cm and a total height ≥ 1.5 m. Mean basal area of 0.4 m^2/ha
Erbo *et al.*, (2020)	Shara (Arba Minch Zuria District, SNNPR)	31	138 stems/ha	Only includes individuals with a DBH ≥ 2.5 cm and a total height ≥ 1.5 m. Mean basal area of 0.25 m^2/ha
Kuma & Shibru, (2015)	Oda forest (Wolaita Zone, SNNPR)	32	12 stems/ha including saplings	Only includes individuals with a DBH ≥ 2.5 cm. Oda forest was noted to have undergone past degradation due to tree cutting for wood fuel and construction materials, and was in the process of being restored

Erbo *et al.* (2020) additionally surveyed stem density distribution, basal area, and regeneration of *O. lanceolata* at their two study sites (Mayile and Shara). The stem density distributions at both sites formed an inverted J-shape (Figure 4.2(i)), which was considered to be indicative of high regeneration but poor recruitment, the latter possibly due to selective cutting of larger sized individuals. The basal area distribution across diameter size classes followed a Gaussian curve pattern at the Mayile site only, indicating dominance of a few mature individuals at this site as a result of poor recruitment and regeneration (Figure 4.2(ii)). Similarly, an analysis of the proportion of seedlings to saplings to mature trees was also consistent with poor recruitment at the Mayile site only (Figure 4.2(iii)).

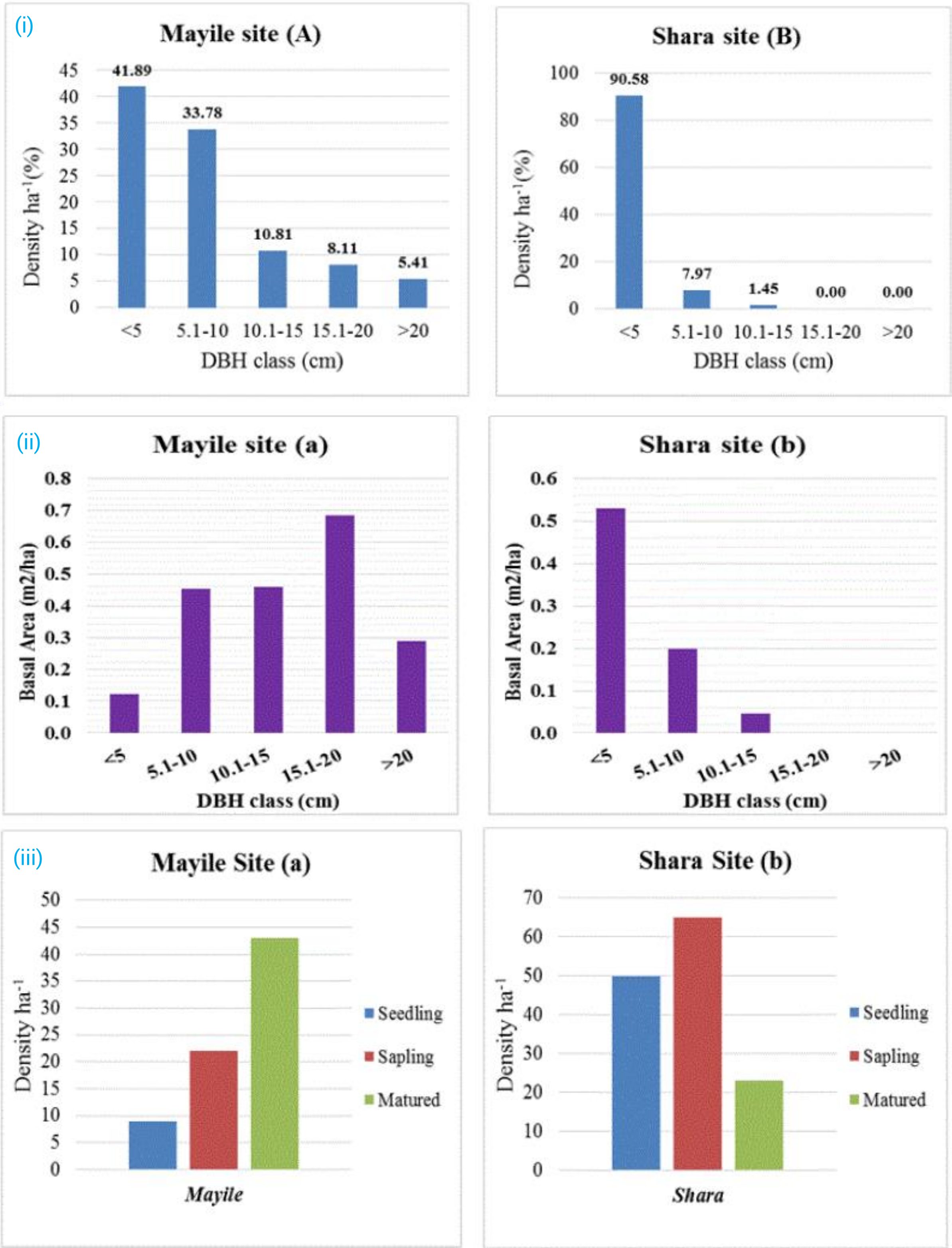

Figure 4.2: Stem density distribution, basal area distribution, and proportion of seedlings: saplings: mature *O. lanceolata* trees at two sites in Southern Ethiopia. Figures reproduced with permission from Erbo *et al.* (2020).

Threats: Bekele *et al.* (2019) described the main threats to *O. lanceolata* in Ethiopia as changes in land use and environmental degradation, with Erbo *et al.* (2020) highlighting that there was grazing, fuel wood collection, and agricultural expansion in areas where the species showed poor recruitment.

The species is also impacted by overharvest, which particularly affects the number of mature trees (Erbo *et al*., 2020). Ethiopia was noted by Gachambi Mwangi *et al*., (2023) to possess an industry for essential oil extraction and processing, although no information could be located on volumes of *O. lanceolata* processed, or whether the industry primarily deals with *O. lanceolata* harvested from Ethiopia or from other countries.

Trade: Ethiopia has submitted all annual reports to CITES for the period 2013-2022 except for 2013, which had not yet been received at the time of writing. Ethiopia has not published any CITES export quotas for this species.

No direct trade in *O. lanceolata* was reported from Ethiopia until 2022, when 1600 kg of wild-sourced oil was exported to India for commercial purposes, as reported by Ethiopia only. No indirect trade in *O. lanceolata* originating in Ethiopia was reported 2013-2022.

Management:

Legislation: Forest Development, Conservation and Utilization Proclamation No. 1065/2018 defines forest ownership types and lays out provisions relating to the development, conservation, and sustainable use of forest resources in Ethiopia. The proclamation states that the use of productive state or protected forests (either by government organisations or concession holders) requires a management plan approved by the responsible authority, with Article 22 stating that no person shall harvest forest products without the necessary permit from the Ministry, responsible regional authority, or relevant private forest owner. Article 20 of the proclamation further states that the Government shall ensure that any licence issued for forest product trade is applied “in a manner that shall not disturb the natural resource balance of the area”. While Article 25 provides for the establishment of a list of endangered species whose harvest is restricted, a directive containing the list of currently protected species could not be located.

Ethiopia’s national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Processing factories: In 2015, Ethiopia’s *O. lanceolata* processing industry was noted to be based on a signed benefits sharing agreement between the Ethiopian Biodiversity Institute and DOCOMO Plc., a company based in the United States of America (Ayenew, 2015). No information could be located to confirm whether this agreement was still in place or whether it has since been expanded to other companies. Similarly, no information was located on the volumes of *O. lanceolata* processed within Ethiopia, although it should be noted that the CITES Trade Database holds no records of exports of the species from the country (either importer- or exporter-reported) until 2022.

Protected areas: While no information could be located on the occurrence of *O. lanceolata* in specific protected areas, both Seifu *et al.* (2018) and Bekele *et al*., (2019) note that the areas with highest abundance of *O. lanceolata* recorded in their surveys were protected.

Illegal trade: No seizures involving *O. lanceolata* from Ethiopia were reported within the TRAFFIC Wildlife Trade Portal 2013–2023 (TRAFFIC International, 2023).

Uganda

Distribution: *O. lanceolata* was reported to largely occur in eastern Uganda, in the districts of Amudat, Kaabong, Kotido, Moroto and Nakapiripiriti in Karamoja sub-region [northeast Uganda]; and the districts of Bukwo, Kapchorwa and Kween in Sebei sub-region [east] (CITES MA of Uganda *in litt.* to

UNEP-WCMC, 2023; Mugula *et al.*, 2021, 2023). The species has also been reported to occur in southwestern Uganda, in the district of Kabale and parts of the Kigezi sub-region, as well as the Sango Bay area of the Lake Victoria basin (CITES MA of Uganda *in litt.* to UNEP-WCMC, 2023; Ministry of Water and Environment, 2022).

Population status and trends: No estimates of the population size of *O. lanceolata* in Uganda could be located, although Karamoja sub-region is recognised to hold the largest population within the country (Ministry of Water and Environment, 2022). Groves and Rutherford (2016) noted that Uganda was part of the main production zone for *O. lanceolata* destined for international trade, an area in which the species was stated to be "locally rare".

A general decline in the wild population of the species in Uganda has been reported as a result of overexploitation and trade (Ministry of Water and Environment, 2021). This is consistent with the global IUCN Red List assessment for *O. lanceolata*, which noted that some East African subpopulations were declining as a result of exploitation for timber and oil (Wilson, 2018). However, *O. lanceolata* was not included in Uganda's national red list of threatened species for 2016 (Wildlife Conservation Society, 2016) or 2018 (MTWA, 2018).

No stock inventories of the species are reported to have taken place before commercial harvest began in Uganda (Ministry of Water and Environment, 2022). However, some inventories took place in 2021 in the eastern Ugandan districts of Amudat, Bukwo, Kaabong, Moroto and Nakapiripirit [Elgon and Karamoja sub-regions], where commercial harvesting was reported to have last taken place from 2010-2014 (Uwimbabazi *et al.*, 2021). Results indicated that mean standing densities varied from 14 to 32 trees/ha (Table 4.3); the districts where harvesting was reported to have taken place (Amudat, Bukwo and Moroto) had the lowest standing densities (Uwimbabazi *et al.*, 2021). The authors considered the current standing stock of *O. lanceolata* to be "too low to sustain commercial production of raw material for sandalwood oil", and noted that if "local harvesting for fuelwood and charcoal is not checked, the stock is likely to stagnate at the current level" (Uwimbabazi *et al.*, 2021). Levels of recruitment and regeneration were additionally noted to be too low to sustain commercial production (Uwimbabazi *et al.*, 2021).

Table 4.3: Mean stand parameters for *O. lanceolata* recorded at survey sites in districts within the Elgon and Karamoja sub-regions. Table reproduced from Uwimbabazi *et al.* (2021). Potential survey sites were identified based on information from local government personnel, community members involved in the sandalwood trade and the available literature (Uwimbabazi *et al.*, 2021). At each potential site, circular sample plots covering an area of 5000 m^2 were established at 1km intervals along transect lines (Uwimbabazi *et al.*, 2021).

District	No. of trees sampled	Mean standing density/ha	DBH (cm)	Height (m)	Basal area (m^2/ha)	Volume (m^3/ha)
Nakapiripirit	148	20	6.72	4.58	0.17	0.1
Kaabong	49	18	8.79	3.21	0.34	0.18
Moroto	95	31	4.40	3.38	0.07	0.02
Amudat	44	14	4.07	4.47	0.06	0.02
Bukwo	117	16	3.00	2.51	0.04	0.01

Threats: The species has previously faced unsustainable and unregulated harvest in the country (CoP16 Prop. 69; Ministry of Water and Environment, 2022), with Uwimbabazi *et al.* (2021) recommending a 20 year moratorium on commercial harvest of *O. lanceolata* to allow for the recovery of Ugandan populations. Given that there is a current ban on harvest, trade and export from Uganda, illegal harvest is likely to be the largest current threat (see *Management* section).

Local communities in eastern Uganda were reported to mainly use *O. lanceolata* as a source of fuelwood, charcoal, wood for fencing and construction, and for cultural and medicinal purposes (Uwimbabazi *et al.*, 2021). It was noted that *O. lanceolata* is not harvested selectively for these purposes, and that these small-scale uses can foster regeneration and recruitment, since trees are typically harvested by cutting a few stems (Uwimbabazi *et al.*, 2021). In addition to commercial harvesting, *O. lanceolata* populations in eastern Uganda were noted to be threatened by: land use changes (including the conversion of bushland outside of protected areas to agricultural land); the possibility that harvest to supply charcoal and fuelwood will grow to unsustainable levels; seasonal fires started by pastoral communities to prepare new pastures; deforestation linked to the establishment of new communities by nomadic groups; and climate change (Uwimbabazi *et al.*, 2021).

Trade: Uganda has submitted all annual reports to CITES for the period 2013-2022, and has not published any CITES export quotas for *O. lanceolata*.

Direct trade in *O. lanceolata* from Uganda 2013-2022 principally comprised wild-sourced powder (16 500 kg reported by Uganda only) and wild-sourced oil (752 kg reported by Uganda only), traded for commercial purposes (Table 4.4). Importers reported direct trade in 300 kg of wild-sourced timber and 25 kg of wild-sourced extract in 2015 and 2018, respectively.

Indirect trade of *O. lanceolata* originating in Uganda 2013-2022 entirely comprised 850 kg of oil re-exported by Tanzania to India.

Since 2017, Uganda also reported re-exports of wild-sourced trade originating from populations not included in the Appendix II listing, specifically Democratic Republic of Congo and South Sudan. These re-exports predominantly comprised 62 500 kg of logs, 16 500 kg of chips, and 12 500 kg of powder; all trade was reported for commercial purposes. The United Arab Emirates was the only importer of chips and powder, whereas Tanzania, United Arab Emirates, and India were the importers of logs.

Table 4.4: Direct exports of *O. lanceolata* from Uganda, 2013-2022.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
extract	kg	T	W	Exporter											
				Importer						25					25
oil	kg	T	W	Exporter					25	635			92		752
				Importer											
powder	kg	T	W	Exporter							16500				16500
				Importer											
timber	kg	T	W	Exporter											
				Importer			300								300

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024

Management: The Uganda Wildlife Authority (UWA) and National Forestry Authority (NFA) have been part of a collaborative 24-month CITES Tree Species Programme project entitled "Conservation and sustainable management of *Osyris lanceolata*, for economic development in East Africa" (CITES Tree Species Programme, 2024). The project aimed to assess the regional status, management and exploitation of *O. lanceolata* and look-alikes; undertake a non-detriment finding (NDF) for the species; evaluate and improve the capacity of the CITES Authorities in three range States (Kenya, Tanzania and Uganda) to identify products and undertake NDFs; and develop and implement a sustainable management plan, including nursery propagation, for *O. lanceolata* as an economic resource (National Museums of Kenya, 2019). A report produced by Uganda's Ministry of Water and Environment (2021) as part of this project noted that Uganda lacked a well-established system of tracking, monitoring and controlling the sandalwood trade; this was attributed to factors such as the porous nature of the country's borders and the limited capacity of the institutions involved in regulating the trade (Ministry of Water and Environment, 2021). As part of the project Uganda produced an NDF for the species in May 2022 (Ministry of Water and Environment 2022); further detail is given below.

Legislation: Trade in raw *O. lanceolata* was reported to have been banned in 2016 following the species' inclusion in the CITES Appendices (Ministry of Water and Environment, 2022). However, the CITES MA of Uganda (*in litt.* to UNEP-WCMC, 2023) reported that the harvest of *O. lanceolat*a is also prohibited in addition to trade and export; the re-export of processed products manufactured with raw material from neighbouring countries is, however, permitted. It is unclear how long such a harvest ban has been in place or whether it only applies to commercial exploitation; it should be noted that the 2022 NDF published by Uganda implies that harvest by communities is ongoing (Ministry of Water and Environment, 2022). Direct exports of extract, oil and powder taking place from 2017-2019 were noted by the CITES MA of Uganda (pers. com. to UNEP-WCMC, 2023) to have been from stockpiles; the MA (*in litt.* to UNEP-WCMC, 2023) confirmed that there are now no stockpiles remaining of *O. lanceolata* harvested in the country.

Uganda's national legislation is included in Category 3 in the CITES National Legislation Project (legislation that is believed generally not to meet any of the four requirements for effective implementation of CITES), and the country was identified as a priority Party by SC77. The most recent legislative status table (updated November 2023) noted that enabling legislation was adopted by Parliament in 2019, and that the CITES Secretariat had provided comments on a revised draft of implementing regulations in 2022.

Non-detriment findings: Uganda published an NDF for *O. lanceolata* in May 2022 (Ministry of Water and Environment 2022), and the CITES MA of Uganda (*in litt.* to UNEP-WCMC, 2023) confirmed that this document remained valid. The NDF does not include a conclusion of whether trade should resume or whether the moratorium should remain in place. However, noting that "there are no documented conservation efforts of *O. lanceolata* in Uganda", it includes a strategy aiming to promote recovery and sustainable management, including the restoration of degraded habitats, the establishment of coppice management regimes, and the establishment of ex-situ plots.

A range of measures have reportedly been implemented to protect sandalwood from adverse trade-related impacts, including efforts to support local communities in planting alternative sources of firewood and the establishment of local bye-laws relevant to tree cutting, bush burning and charcoal burning (Ministry of Water and Environment, 2021).

Companies participating in sandalwood trade: Two companies (Sky Beam Africa Ltd. and Uganda Wood Impex Ltd.) were reported to have been legally registered to participate in the trade in sandalwood from Uganda (Ministry of Water and Environment 2022).

Sky Beam Africa Ltd. established a processing facility in the Tororo district in 2008; an MOU with the company and the local government of Moroto District for the export of *O. lanceolata* harvested from the Karamoja region was in place 2011-2015 (Ministry of Water and Environment 2022; CITES SA of Uganda *in litt.* to UNEP-WCMC, 2023). The company ceased operating in 2019 after it was found to have breached the terms of the MOU, including the commitment made to support the regeneration of *O. lanceolata* in the local area (Ministry of Water and Environment, 2022). Additionally, the company was reportedly found to have been reliant on illegally harvested sandalwood originating from the Karamoja sub-region, the Democratic Republic of Congo, Kenya, New Caledonia, South Sudan and Tanzania (Ministry of Water and Environment 2022).

Uganda Wood Impex Ltd. (UWIL), based in the Kalungu district, was licenced to trade in sandalwood by the CITES MA of Uganda in 2015 and according to the Ministry of Water and Environment (2021) was still operating in the country at that time. UWIL is reportedly permitted to import raw sandalwood from the Democratic Republic of Congo and South Sudan (Ministry of Water and Environment, 2021). The company produces a range of sandalwood products for export, including 100-200 kg of sandalwood oil per month [approximately 5 kg of raw sandalwood converts to 1 kg of oil, although the precise conversion factor was noted to vary according to the quality of the wood] (Ministry of Water and Environment, 2021).

Illegal trade: Uganda is reported to feature in a complex, organised network of illicit sandalwood trade that involves several East African countries (Okumu, 2022), with sandalwood smugglers allegedly able to make large amounts of money (approximately USD 100 000 per 14-ton truckload) from the sale of raw sandalwood to forest crime syndicates (Kioko, 2022). According to a report produced in 2022 by the ENACT programme (Enhancing Africa's response to transnational organised crime), illegally harvested Kenyan sandalwood was still being transported to Uganda and then fraudulently exported back to Kenya, before ultimately being used to supply international markets (Okumu, 2022)[22]. Several seizures of illegally harvested *O. lanceolata* by the Ugandan law enforcement authorities are reported to have occurred between 2016-2019, involving quantities ranging from 500 kg to 50 tons [5000 kg] (Ministry of Water and Environment, 2021). While some seizures were reported to have involved illegally harvested wood originating from Kenya, others involved wood that was reportedly being transported to Kenya (Ministry of Water and Environment, 2021).

Multiple factors were identified as contributing to the difficulty in controlling the illegal sandalwood trade in Uganda, including: the flexibility of illegal trade routes and the forms of concealment used by traffickers; the lack of guidelines regulating sandalwood harvesting; limited awareness and capacity of the enforcement authorities; limited information on levels of compliance among legally registered traders; political interference in the prosecutions of people accused of being involved in illicit trade; corruption; and high poverty levels (Ministry of Water and Environment, 2021). Measures reportedly being implemented to tackle the illegal sandalwood trade include establishing check-points on roads used by illegal traders and the establishment of a national wildlife crime coordination task force (Ministry of Water and Environment, 2021).

United Republic of Tanzania

Distribution: The species was described as being widely distributed in "both reserved and unreserved forests" in the Arusha, Manyara, Dodoma, Singida, Iringa, Njombe, Rukwa, Pwani, Tanga and Mbeya regions; and in the Eastern Arc Mountains (i.e. Kilimanjaro, Tanga and Morogoro regions) (Masota, 2021; Otieno & Hilonga, 2022). An NDF prepared by Tanzania also notes that the National Forest Resources Monitoring and Assessment of Tanzania (carried out 2009-2014) found that *O. lanceolata* was largely concentrated in bush land of the northern and southern ecozones, as well as being found in the woodlands, forests and grassland of the Southern Highlands, woodlands in the Eastern Highlands, and Bushland in Central Tanzania (Otieno & Hilonga, 2022).

[22] The TRAFFIC Wildlife Trade Portal holds three records of *O. lanceolata* seizures in Kenya 2013–2023, all taking place between 2020-2023, and involving over 1900 kg *O. lanceolata* (TRAFFIC International, 2023)

Population status and trends: The CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) provided estimates of the total number of *O. lanceolata* stems and volume/ha for 24 regions, but the methodology used to generate these data was not provided. The total number of stems across these regions was estimated to be c. 984 000, and the total volume c. 14 000 m^3 (Table 4.5); the MA of Tanzania highlighted that most of the trees recorded were of small diameter and therefore not suitable for harvest.

Table 4.5: Estimated stand parameters for *O. lanceolata* from selected regions of Tanzania. Source: CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023).

Zone	Region	Diameter classes (cm)				Total number of stems	Total volume (m^3)
		0 - 9.9 cm		10 - 19.9 cm			
		Number of stems	Volume (m^3)	Number of stems	Volume (m^3)		
Eastern	Dar es Salaam	-	-	-	-	-	-
	Morongoro	152990.14	1147.16	-	-	152990.14	1147.16
	Pwani	113.49	2.65	-	-	113.49	2.65
Southern	Lindi	2004.93	46.79	155.36	6.86	2160.29	53.65
	Mtwara	756.58	17.66	310.71	13.71	1067.29	31.37
	Ruvuma	22498.55	168.70	-	-	22498.55	168.70
Southern Highlands	Rukwa	23623.48	177.13	-	-	23623.48	177.13
	Njombe	190636.79	3460.34	116116.75	5123.75	306753.54	8584.09
	Iringa	97868.69	733.84	-	-	97868.69	733.84
	Mbeya	28685.65	215.09	-	-	28685.65	215.09
Central	Manyara	9000.39	103.14	2951.77	130.25	11952.16	233.39
	Dodoma	74245.22	556.71	-	-	74245.22	556.71
	Singida	7506.14	68.27	932.14	41.13	8438.28	109.40
Lake	Mara	-	-	1864.27	82.26	1864.27	82.26
	Simiyu	3374.78				3530.14	32.16
	Mwanza	151.32				306.67	10.39
	Kagera	-	-	-	-	-	-
	Geita	699.84				855.19	23.19
Western	Shinyanga	208.06				208.06	4.86
	Kigoma	20248.70				24016.08	318.07
	Katavi	23623.48				24982.84	237.12
Northern	Kilimanjaro	50621.74	379.57	2019.63	89.12	52641.37	468.69
	Arusha	68055.08	572.62	-	-	68055.08	572.62
	Tanga	77620.00	582.01	-	-	77620.00	582.01
Total		**854533.03**	**8610.67**	**129943.45**	**5733.86**	**984476.48**	**14344.54**

A study to estimate the standing stock of *O. lanceolata* in Tanzania was also completed in 2021 as part of a CITES Tree Species Programme project (Masota, 2021; see *Management* section). Three of the districts where the species is known to occur were selected for survey (Babati, Kondoa and Hanang), on the basis that they host *O. lanceolata* populations producing the best quality oil (Table 4.6). Details of the methodology used can be found in Masota (2021), but it should be noted that transect locations were selected on the basis of a high concentration of *O. lanceolata,* and all transects were outside of protected areas (Masota, 2021). The justification given is that these are areas where harvest is "likely to be allowed" (Masota, 2021). Note that the results for Gubali and Hachwi Village Land Forest Reserves (VLFRs) were separated according to whether the stands were categorised locally as "male" or "female".

Table 4.6: Stand parameters for *O. lanceolata* recorded at 11 Village Land Forest Reserves (VLFRs) in Babati and Hanang districts (Manyara region) and Kondoa district (Dodoma region). Source: Masota (2021).

District	Location	Area surveyed	Stem density (no/ha)	Basal area (m^2/ha)	Biomass (tonnes)
Babati	Warimbu VLFR	50	12	0.008	0.019
	Duru VLFR	1400	25	0.015	0.032
	Haisamu VLFR	180	94	0.096	0.28
	Ayatlaa VLFR-	30	45	0.022	0.048
	Gedagerere VLFR	1200	6	0.004	0.01
Hanang	Gidagewong VLFR	720	103	0.09	0.231
	Gabadau VLFR	230	39	0.029	0.073
	Sebas VLFR	40	7	0.006	0.013
Kondoa	Gubali VLFR ("male")	900	12	0.006	0.014
	Gubali VLFR ("female")	900	2	0.001	0.001
	Hachwi VLFR ("male")	1503	6	0.004	0.01
	Hachwi VLFR ("female")	1503	1	0.0001	0.001
	Kolo VLFR	1030	8	0.006	0.016

Based on these data, total standing biomass of *O. lanceolata* in the three districts was estimated to be 110.1, 183.38 and 45.9 tonnes in Babati, Hanang and Kondoa respectively (Masota, 2021). An NDF prepared by Tanzania notes that an earlier survey, conducted in 2005, found standing biomass of 29 and 62 tonnes in Babati and Hanang respectively, and concluded that the ban on harvest implemented in 2007 (see *Management* section) has allowed the species to recover (Masota, 2021).

Diameter distribution classes for each surveyed forest are shown in Figure 4.3. Masota (2021) noted that only Kolo, Haisamu and Gidagewong VLFRs had trees in the largest diameter class of >8 cm. The maximum DBH attained in the VLFRs surveyed was 11.6 cm, which is under half the DBH of 24 cm that the species has been noted to potentially attain according to the NAFORMA (National Forest Resources Monitoring and Assessment of Mainland Tanzania) database (Masota, 2021). The results were considered to show that the species was regenerating after past illegal exploitation. However, poor regeneration was noted to be affecting a large number of VLFRs when considering the number of stems/ha that had a DBH of <1 cm (Table 4.7) (Masota, 2021). The diameter distributions of Kolo, Gubali, Gedagerere and Sebas VLFRs were considered not to follow a reverse J shape, suggestive of poor recruitment (Masota, 2021), and the density of stems with a DBH of <1 cm in Warimbu, Haisamu, Gedagerere, Gabadau and Hachwi was also suggested to be low (Masota, 2021). Most regeneration was noted to be from coppiced stumps (Masota, 2021).

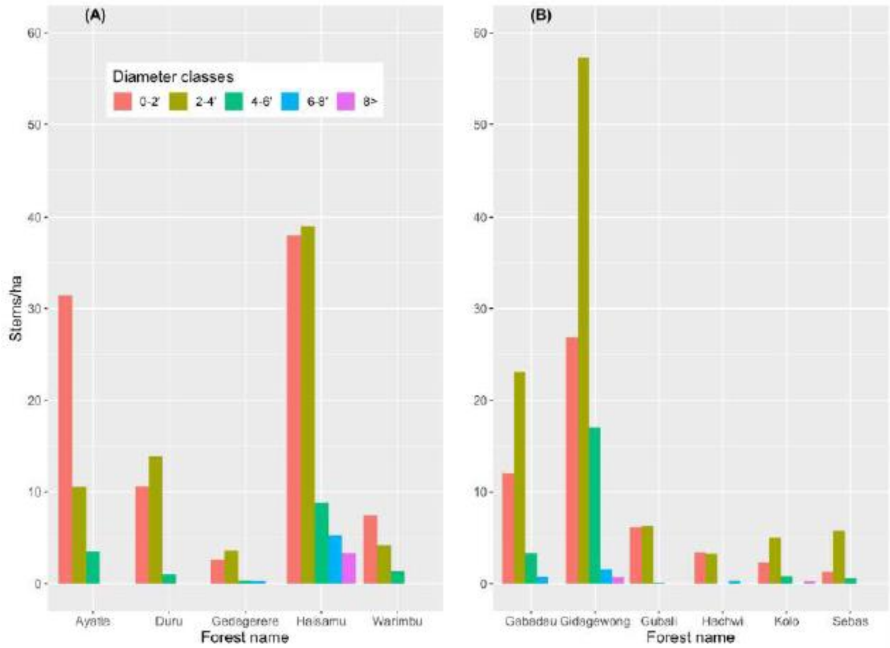

Figure 4.3: Density of diameter distribution classes (measured in cm) recorded at 11 Village Land Forest Reserves in Babati, Hanang and Kondoa districts. Figure reproduced with permission from Masota (2021).

Table 4.7: Number of *O. lanceolata* stems <1cm DBH recorded at 9 of the 11 Village Land Forest Reserves (VLFRs) in Babati, Hanang and Kondoa districts. Table reproduced from Masota (2021).

District	Forest	No. stems >1 cm DBH/ha
Babati	Warimbu VLFR	3.3
	Duru VLFR	19.4
	Haisamu VLFR	6
	Gedagerere VLFR	4.1
Hanag	Gidagewong VLFR	24
	Gabadau VLFR	4.9
Kondoa	Gubali VLFR "male"	28.3
	Gubali VLFR "female"	1.1
	Hachwi VLFR "male"	4.6
	Hachwi VLFR "female"	1.5
	Kolo VLFR	8.3

Threats: Tanzania was the main country in which initial large-scale exploitation of East African *O. lanceolata* took place (CoP16 Prop. 69; Mwang'ingo *et al.*, 2010). Overexploitation was reported to have been impacting the species since the 1990s (Masota, 2021); preferential harvest of female trees was noted to have been an additional concern, as well as preferential targeting of certain subpopulations due to differences in oil quality (Mwang'ingo *et al.*, 2010). By 2006 surveys of 17 districts showed there was insufficient sandalwood "to support industrial investment" (Masota, 2021), and harvest of the species was banned as a result (Otieno & Hilonga, 2022; see *Management* section). Recent poor regeneration rates of *O. lanceolata* observed in surveys by Masota (2021) were hypothesized to have been caused by forest degradation resulting from extraction of firewood and charcoal, as well as grazing.

O. lanceolata is also used domestically for medicine, and its fruits were noted to be used as a dietary supplement, but this form of use was not considered to have had negative effects on the species until it became popular in the international market (Masota, 2021; Otieno & Hilonga, 2022).

Trade: Tanzania has submitted all annual reports to CITES for the period 2013-2022 except for 2021, which had not been received at the time of writing. Tanzania has not published any CITES export quotas for the species.

Direct trade in *O. lanceolata* from Tanzania 2013-2022 comprised 26 790 kg of oil, 24 001 kg of powder, and 525 kg of sawn wood as reported by Tanzania, all of which was wild-sourced and traded for commercial purposes (Table 4.8). Importers reported direct trade in wild-sourced powder (24 000 kg), timber (17 500 kg) and oil (1215 kg) for commercial purposes. However, Tanzania has stated (*in litt.* to the CITES Secretariat, 2023) that there is no trade in *O. lanceolata* that is harvested in Tanzanian forests, implying that the reported trade actually consisted of re-exports.

No indirect trade in *O. lanceolata* originating in Tanzania was reported 2013-2022.

Table 4.8: Direct exports of *O. lanceolata* from Tanzania, 2013-2022. Hyphens indicate years where exporter CITES annual reports have not yet been received.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
oil	kg	T	W	Exporter							24000		-	2790	26790
				Importer					1215						1215
powder	kg	T	W	Exporter								24000	-	1	24001
				Importer									24000		24000
sawn wood	kg	T	W	Exporter									-	525	525
				Importer											
	m^3	T	W	Exporter									-	0.08	0.08
				Importer											
timber	kg	T	W	Exporter									-		
				Importer										17500	17500

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024

Management: Between 2020-2021 a project funded by the CITES Tree Species Programme (CTSP) was conducted to assess the current management status of *O. lanceolata* from Tanzania, Kenya and Uganda, with the aim of ensuring that international trade in the species is not detrimental to the conservation of the resource in range States (CITES Tree Species Programme, 2023). Outputs have included an assessment of standing stock in three districts (the results of which are outlined in the *Population and trends* section), research into silvicultural practices for domestication of *O. lanceolata* (Maduka, 2021), and gathering of information related to current harvesting, processing, transport, trade, control and monitoring of the species in Tanzania (Masota, 2021).

Legislation: Tanzania is reported to have banned trade in wild sandalwood in 1993 (Otieno & Hilonga, 2022) and to have prohibited harvest in 2004 (via Government Notice No. 335 of 10/09/2004[23] (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023)), 2006 (Otieno & Hilonga, 2022) and 2007 (Kioko, 2022). According to the CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023), as harvesting is prohibited, export is restricted "unless the raw materials are imported and processed in the country". Several sources note that the ban has proven hard to enforce and note that illegal trade has persisted (Kioko, 2022; Masota, 2021; National Museums of Kenya, 2019; Otieno & Hilonga, 2021), however

[23] This prohibition appears to be limited to the roots of sandalwood *O. santalum*; Kew's Plants of the World Online does not list this as a valid name or synonym for *O. lanceolata*.

some recent studies in the north of the country have found no records of recent illegal harvest (Otieno & Hilonga, 2022). The country has also prohibited the export of logs (of all species) since 2004 (Lukumbuzya & Sianga, 2017).

Tanzania's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Non-detriment findings: An NDF for the species based on the information collected by the CTSP project outputs described above (Otieno & Hilonga, 2022) was produced in July 2022. It concludes that "there is not enough quantitative documentation that can justify legalization of harvesting", and notes that, while the harvest ban appears to have aided recovery, stems remain well below the average DBH for a mature individual of this species (Otieno & Hilonga, 2022).

The NDF and the CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) also note that most *O. lanceolata* specimens occur on public lands where there is "little government control in terms of management", and the NDF considers that special strategies need to be developed to manage and conserve the species in this context (Otieno & Hilonga, 2022). Enrichment planting in forests and plantations are highlighted as available options to increase existing stock (Otieno & Hilonga, 2022).

Processing factories: Otieno & Hilonga (2022, 2021) reported Tanzania to have three sandalwood processing factories in the towns of Babati (Mayara Region), Mombo (Tanga Region), and Dar es Salaam, although the CITES MA of Tanzania (*in litt.* to the CITES Secretariat, 2023) reported that there were currently four "primary wood industries" that were processing sandalwood. None of these facilities were reported to be licenced to process *O. lanceolata* harvested in Tanzania; instead, the factories were reported to import their raw materials from South Sudan, Uganda, Democratic Republic of Congo, Australia, India, Dubai and China for processing and re-export (CITES MA of Tanzania *in litt.* to the CITES Secretariat, 2023; Otieno & Hilonga, 2022). Each processing factory was stated to have a capacity of 360 tonnes sandalwood per year (Otieno & Hilonga, 2022). Otieno and Hilonga (2022) imply that the existence of processing factories presents a laundering risk for *O. lanceolata* illegally harvested within Tanzania.

It should also be noted that the CITES Trade Database does not hold any records of Tanzania importing *O. lanceolata* from Uganda 2013-2022, despite it being included in the list of countries from which *O. lanceolata* is imported to be processed. However, there is a possibility that imports from Uganda are of *O. lanceolata* originally harvested in a country that is not included in the CITES listing.

Protected areas: The NDF prepared by Tanzania notes that the species occurs in a large number of national forest reserves and Village Land Forest Reserves (Otieno & Hilonga, 2022).

Illegal trade: Illegal exploitation prior to the harvest ban imposed in 2006/2007 was noted to be extensive (Otieno & Hilonga, 2022). Although some recent surveys have found no evidence of illegal harvest, an assessment of current harvest, processing and trade in *O. lanceolata* in Tanzania concluded that there was generally insufficient tracking and records of actual trade volumes of the species in the region (Otieno & Hilonga, 2021). No seizures involving *O. lanceolata* from Tanzania were reported within the TRAFFIC Wildlife Trade Portal 2013–2023 (TRAFFIC International, 2023).

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Illegal trade: Illegal trade and cross-border trafficking in the species has been noted to be a particular concern in Burundi, Uganda and Tanzania.

Misreporting of re-exports: Uganda and Tanzania both have a prohibition on the export of *O. lanceolata* products derived from trees harvested within national borders, but both allow the re-export of *O. lanceolata* that has been imported from elsewhere and processed in their countries. The last stockpiles of *O. lanceolata* harvested in Uganda were reported to have been exhausted in 2019; no stockpiles appear to be present in Tanzania. Despite this, there are records in the CITES Trade Database of direct exports from both countries. UNEP-WCMC has contacted Uganda and Tanzania to clarify whether any wild-sourced *O. lanceolata* exports originally reported as direct trade should have been reported as re-exports originating from other range States. Uganda confirmed that direct exports from the country as recorded in the CITES Trade Database originated from Uganda.

Limited geographic scope of the current listing: It should be noted that the restriction of the Appendix II listing of *O. lanceolata* to the populations of Burundi, Ethiopia, Kenya, Rwanda, Uganda and Tanzania means that the picture of global trade reflected in the CITES Trade Database is incomplete. The Democratic Republic of Congo and South Sudan both appear to be major exporters of *O. lanceolata* logs, based on information contained within Uganda's annual reports to CITES and information received from CITES Management Authorities in response to the consultation relating to the RST. However, the true volume of trade is not known as their populations are not included in the CITES listing. The geographic restriction of the listing has additionally created opportunities for laundering *O. lanceolata* in countries where harvest has been banned.

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Aquilaria crassna: Viet Nam

A. Summary

CRITERIA MET:	Criterion i) trade in an endangered species and criterion v) sharp increase in trade from Viet Nam.
GLOBAL STATUS:	Globally Critically Endangered (2017 assessment), with a decreasing population trend, based on an estimated population decline of over 80% over the last three generations (~150 years).
VIET NAM: No response received to the consultation relating to the RST	Reported to be widespread in central and southern Viet Nam, however the wild population is considered to have dramatically declined, with one study estimating a decrease from >10 000 individuals before 1970 to near extinction in 2005. No more recent descriptions of population status in the wild could be located. Viet Nam has submitted all annual reports to CITES for the period 2013-2022 except for 2022, which had not been received at the time of writing. Viet Nam has not published any CITES export quotas for this species. Direct trade in *A. crassna* from Viet Nam 2013-2022 principally comprised high volumes of artificially propagated chips, derivatives, extract, live plants, powder, and wood products traded for commercial purposes. Wild-sourced trade was reported by importers only (with the exception of 0.01 litres of oil reported by Viet Nam for scientific purposes), and predominantly comprised 9980 kg of chips and 2188 kg of derivatives. Permit analysis suggests that all trade reported by importers as wild-sourced through 2021 was reported as artificially propagated by Viet Nam; comparison of trade reported for 2022 was not yet feasible. Viet Nam's national legislation reportedly only allows the export of *A. crassna* agarwood grown and sourced from plantations, and trade in wild-sourced *A. crassna* is prohibited. Plantations of *A. crassna* in Viet Nam were reported to cover ~ 16 000-30 000 ha, with "millions" of individuals occurring in home gardens. A formal registration system is in place for plantation agarwood, requiring all companies or households operating *A. crassna* plantations to be registered with the Forest Department, which is in charge of the enforcement of local regulations and the provision of seeds for home gardens.
PROVISIONAL CATEGORY:	Given that harvest and export of wild specimens is reported to be illegal, and that Viet Nam has not reported any commercial exports of wild-sourced specimens, the provisions of Article IV are not applicable; therefore, categorised as **Less concern**. However, illegal trade and export of timber has an impact on the survival of the species in the wild, and remains a concern not related to the implementation of Article IV. It may therefore be relevant to consider requesting Viet Nam to publish a zero-export quota for wild specimens. Possible misreporting of artificially propagated exports by importers as wild-sourced trade could also be queried.

B. RST background

PC26 marked the first time that *Aquilaria crassna* has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Biology: *A. crassna* is a light demanding, evergreen tree species, reaching up to 30 m in height and between 40-60 cm (occasionally 100 cm) in diameter (Schmidt & Nguyen, 2004; WFO, 2023). It occurs scattered in natural evergreen forests at 300-900 m altitude in rocky, shallow soils, often along streams (Schmidt & Nguyen, 2004). A study in Thailand found that 74% of *A. crassna* trees surveyed produced fruit when they had reached 30-40 cm diameter at breast height (DBH); 93% of trees produced fruit when they had reached ≥40 cm DBH (Zhang *et al.*, 2008). Loc and Luu (2002) estimated that the species starts flowering after 6-8 years. *A. crassna* seeds are reported to be recalcitrant with very short viability (Schmidt & Nguyen, 2004), while the genus in general has been noted to have a slow/short germination rate (Tabin & Shrivastava, 2014). However, high rates of germination success for the species (92%) have been observed under nursery conditions (Soehartono & Newton, 2001).

A. crassna is primarily harvested for its valuable aromatic resin, known as agarwood (Harvey-Brown, 2018), which is induced by stress factors (wood injuries or attacks from bacteria and fungi) as a defence mechanism (Schmidt & Nguyen, 2004). Tran *et al.* (2003) noted that only around 20% of *Aquilaria* trees in Viet Nam were reported to produce this resin; other studies have estimated a lower percentage of 1% to 10% of all wild trees (Thompson *et al.*, 2022), and that trees also need to reach a DBH >20cm to start producing. The best yields were reported to be obtained from trees that were over 50 years old (Tran *et al.*, 2003).

D. Country review

Viet Nam

Distribution: Globally, *A. crassna* occurs in Cambodia, Lao People's Democratic Republic, Viet Nam, and Thailand (Harvey-Brown, 2018; WFO, 2023).

In Viet Nam, *A. crassna* was reported to be widespread in the central and southern regions, including Phu Quoc Island in Kien Giang province (Schmidt & Nguyen, 2004).

Population status and trends: *A. crassna* was globally categorised as Critically Endangered in a 2017 IUCN assessment, on the basis that the species is estimated to have undergone an 80% decline over the last ~150 years as a result of overexploitation (Harvey-Brown, 2018).

The species was categorised as endangered in the Viet Nam Red Data Book in 1996 (Loc & Luu, 2002); however, Viet Nam's National Biodiversity Strategy to 2020, vision to 2030 (Ministry of Natural Resources and Environment, 2011) lists the species as critically endangered in the country. A 2007 review of Viet Nam's wildlife trade policy (Nguyen *et al.*, 2007) noted that wild populations of *A. crassna* in Viet Nam were estimated to have declined from >10 000 individuals before 1970 to near-extinction in 2005. Tran *et al.*, (2003) also reported the population of *A. crassna* in natural forests of Viet Nam to have declined dramatically; this was in line with the findings of Loc & Luu (2002), who described *A. crassna* as only being found in scattered stands characterised by a low number of trees as a result of over-exploitation. The remaining stands were reported to be in the southern coastal fringes and the western part of Da Nang province (Loc & Luu, 2002).

Viet Nam's 4th country report on its implementation of the Convention on Biological Diversity noted that *A. crassna* had significantly regenerated in plantation forests as a result of reforestation programs (Ministry of Natural Resources and Environment, 2008), however more recent information on these programs could not be located. The genus in general is noted to occur at low densities of up to 2 individuals/ha (Thompson *et al.*, 2022).

Threats: *A. crassna* is considered to be primarily under threat as a result of overexploitation for its highly valued agarwood (Harvey-Brown, 2018; Ministry of Natural Resources and Environment, 2011; Tran *et al.*, 2003), which is typically used in Vietnamese traditional medicine, and for meditation purposes (Harvey-Brown, 2018). However, the species is also threatened by general forest degradation, habitat loss, forest fires, and ecosystem fragmentation (Dang *et al.*, 2001; Thuaire *et al.*, 2021).

Aggressive approaches to inoculation of microorganisms into *A. crassna* in plantations (aimed at stimulating the production of the agarwood resin) have additionally been reported to lead to the premature death of trees (Zaremski *et al.*, 2022).

Trade: *A. crassna* was listed in CITES Appendix II on 12 January 2005 as part of the genus listing for *Aquilaria* spp with annotation CoP13 #1; the annotation has changed multiple times but the listing currently carries annotation CoP19 #14[24]. Viet Nam has submitted all annual reports to CITES for the period 2013-2021; the report for 2022 had not been received at the time of writing. Viet Nam has not published any CITES export quotas for this species.

According to the CITES Trade Database, direct trade in *A. crassna* from Viet Nam 2013-2022 principally comprised high volumes of chips, derivatives, extract, live plants, powder, and wood products; the vast majority of trade was in artificially propagated specimens for commercial purposes (Table 5.1), with China, Egypt, Saudi Arabia and United Arab Emirates as the principal importers. Wild-sourced trade predominantly comprised 9980 kg of chips and 2188 kg of derivatives traded for commercial purposes; all wild-sourced trade was reported by importers only (China, Indonesia, Kuwait, Saudi Arabia, and Singapore). The only wild-sourced trade reported by Viet Nam was 0.01 litres of wild-sourced oil for scientific purposes. Permit analysis suggests that all trade reported by importers as wild-sourced through 2021 was reported as artificially propagated by Viet Nam; comparison of trade reported for 2022 was not yet feasible.

Indirect trade in *A. crassna* originating in Viet Nam 2013-2022 principally comprised artificially propagated chips, oil, and powder for commercial purposes (Table 5.2). Wild-sourced indirect trade originating in Viet Nam comprised 484 kg of chips, 92 items of extract, and 0.05 kg of oil reported by importers; re-exporters reported only 80 kg of wild-sourced oil.

Direct trade from Viet Nam was also reported at the genus level (*Aquilaria* spp.) by importers only, and predominantly comprised artificially propagated chips (58 627 kg and 9008 units) and powder (11 527 kg) traded for commercial purposes. The only wild-sourced direct trade reported at the genus level was 95 kg of chips for commercial purposes reported by Malaysia in 2014, and 0.02 litres of oil for scientific purposes by the United States in 2013.

[24] All parts and derivatives except: a) seeds and pollen; b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) fruits; d) leaves; e) exhausted agarwood powder, including compressed powder in all shapes; and f) finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings.

Table 5.1: Direct exports of *A. crassna* from Viet Nam, 2013-2022. Quantities greater than one have been rounded to whole numbers where applicable. Hyphens indicate where exporter annual reports have not yet been received.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
bark	kg	T	A	Exporter										-	
				Importer								2			2
carvings	kg	P	A	Exporter		200								-	200
				Importer											
		T	A	Exporter	227	10860			303	221	32			-	11643
				Importer	56										56
		-	-	Exporter										-	
				Importer			14								14
	number of specimens	P	A	Exporter	2									-	2
				Importer						1					1
		T	A	Exporter		226								-	226
				Importer											
chips	kg	P	A	Exporter		3								-	3
				Importer						2	2	2	14		20
		T	A	Exporter	19751	64946	150816		28898	19191	16125	64134	90886	-	454747
				Importer	3986	594	47	2702	530	26189	10661	28910	64768	378380	516766
			W	Exporter										-	
				Importer		35						200	305	9440	9980
	m^3	T	A	Exporter						2				-	2
				Importer											
	number of specimens	T	A	Exporter					1		180			-	181
				Importer							500	2502			3002
cosmetics	kg	T	A	Exporter											
				Importer									36		36
derivatives	kg	T	A	Exporter	1811	1845					11597	5094	12802	-	33148
				Importer							50	6193	11183		17426
			W	Exporter										-	
				Importer									450	1738	2188
	number of specimens	T	A	Exporter		188240					296000	97000	103000	-	684240
				Importer								1100			1100
			O	Exporter		100000								-	100000
				Importer											

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
extract	kg	T	A	Exporter		1	222							-	223
				Importer	2					0.01					2
	l	T	A	Exporter			100000							-	100000
				Importer											
	number of specimens	T	A	Exporter			230108							-	230108
				Importer											
leaves	kg	T	A	Exporter	50	41			25	200				-	316
				Importer											
live	kg	T	A	Exporter	62	150	34							-	246
				Importer							50				50
	number of specimens	T	A	Exporter	400000		27350			6500				-	433850
				Importer											
logs	kg	T	A	Exporter	8	8	16389				135	77	465	-	17082
				Importer	13			44	73	443	111		18	46503	47205
	m^3	T	A	Exporter		61								-	61
				Importer											
oil	kg	P	A	Exporter										-	
				Importer						0.01					0.01
		T	A	Exporter		0.06			88	63	130	70	181	-	532
				Importer			0.03		0.02	48	62	99	104	140	453
			W	Exporter										-	
				Importer									8		8
	l	S	W	Exporter		0.01								-	0.01
				Importer											
		T	A	Exporter	91	262	2415		161	106	132	153	194	-	3514
				Importer	6	3	3	20	9	20	86	62	64	150	423
	number of specimens	T	A	Exporter			3							-	3
				Importer											
plywood	kg	T	A	Exporter										-	
				Importer									200		200
powder	kg	P	A	Exporter										-	
				Importer						0.1	2	2			4
		T	A	Exporter	13229	51710	500		111606	172356	147765	134432	289159	-	920758
				Importer	3217	510		1	4000	57174	32924	40021	96934	43565	278347
			W	Exporter										-	
				Importer									10		10

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
sawn wood	kg	T	A	Exporter	2314	260								-	2575
				Importer	478	2		5		11000	69000	22000	10100	10	112595
	number of specimens	T	A	Exporter	3									-	3
				Importer											
seeds	kg	T	A	Exporter			70							-	70
				Importer											
stems	kg	T	A	Exporter		5			4064	5964				-	10033
				Importer											
timber	kg	T	A	Exporter			2	351						-	353
				Importer	75		1472			11500	19	5	9	56418	69498
			W	Exporter										-	
				Importer		19								550	569
	m3	T	A	Exporter										-	
				Importer		60				2					62
unspecified	kg	-	-	Exporter										-	
				Importer								2363	10		2373
veneer	number of specimens	-	-	Exporter										-	
				Importer						93					93
wood product	kg	T	A	Exporter			2259		388	484				-	3131
				Importer				2	0.03	4000	428	300	1694	6431	12854
			W	Exporter										-	
				Importer										300	300
	number of specimens	T	A	Exporter			46		168020	393500				-	561566
				Importer											

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 5.2: Indirect exports of *A. crassna* originating in Viet Nam, 2013-2022. Quantities greater than one have been rounded to whole numbers where applicable.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
chips	kg	T	A	Exporter	911		10463			2157	243	192	1960	325	16251
				Importer	1144	260	345		260	1463	1918	1571	2662	227	9851
			W	Exporter											
				Importer			294						190		484
cosmetics	kg	T	A	Exporter							59	2	1	0.1	63
				Importer							0.4	0.3	0.1		0.8
extract	kg	T	A	Exporter			0.1	0.2			0.4	8	3	0.05	12
				Importer								0.2			0.2
	number of specimens	T	A	Exporter											
				Importer								272	952		1224
			W	Exporter											
				Importer								92			92
oil	kg	T	A	Exporter	1		0.05	1	0.003	0.07	39	138	1617	2	1798
				Importer					1			139	8	0.05	148
			W	Exporter	80										80
				Importer								0.05			0.05
	l	T	A	Exporter			10	1	0.8	3.6	30			10	56
				Importer							30				30
powder	kg	T	A	Exporter							13000		198		13198
				Importer									198		198
timber	kg	T	A	Exporter											
				Importer	7	8									15
wood product	kg	T	A	Exporter							218	300	150		668
				Importer				125					2		127

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: Viet Nam's 2017 Forestry Law lays out the management, protection, development, and use rules of Viet Nam's forests, defines forest owners' rights and obligations, and bans unplanned and unpermitted timber logging (Forestry Law, No. 16/2017/QH14., 2017). According to Thompson *et al.*, (2022), Viet Nam's national legislation only allows the export of *A. crassna* agarwood grown and sourced from plantations and home gardens, with trade in wild-harvested agarwood prohibited; the World Resource Institute (2014) reported that harvest and trade of *A. crassna* from Viet Nam has been banned since 1992, but that trade in products from plantations is legal with proper CITES documentation.

The genus *Aquilaria* spp. is not listed as an endangered, precious and rare taxon prioritised for protection in Viet Nam (Decree No.160/2013/ND-CP, 2013).

Viet Nam's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Plantations: *A. crassna* was reported to be frequently cultivated in plantations, mainly in the southern Vietnamese Province of Khanh Hoa and Phu Quoc Island (Tran *et al*., 2003), and within home gardens in the Ha Tihn Province (Loc & Luu, 2002). According to the information gathered by Thompson *et al*. (2022) for the CITES agarwood workshop held in Kuala Lumpur in June 2022, plantations of *A. crassna* in Viet Nam cover 16 000 – 30,000 ha, and "millions" of planted trees occur in home gardens. A formal registration system is in place in Viet Nam for plantation agarwood; the system requires that all companies or households operating *A. crassna* plantations must be registered with the Forest Department in charge of the enforcement of local regulations (Thompson *et al*., 2022). Although Thompson *et al*., (2022) reported that seeds for home gardens are provided by the Government, the origin of these seeds (whether from the wild or from plantations) is unclear.

Illegal trade: Only one seizure involving 100 kg of *A. crassna* agarwood (originating from Viet Nam and seized in Malaysia in 2021) was reported within the TRAFFIC Wildlife Trade Portal 2013--2023 (TRAFFIC International, 2024). Illegal logging cases and forest violation activities were reported to be a continuing issue in general in Viet Nam (Thuaire *et al*., 2021), although no specific cases of illegal harvest involving *A. crassna* were identified.

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Possible discrepancies in reporting the source of trade

All direct trade in *A. crassna* reported by Viet Nam in the CITES Trade Database 2013-2022 was in artificially propagated specimens, with the exception of 0.01 litres of oil for scientific purposes. The species/country combination was therefore included in the selection of species for inclusion in the RST following CoP19 (PC26 Doc. 16.5) based on reporting of wild-sourced trade by importers only, for which the source code may be erroneous.

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Aquilaria malaccensis: Indonesia and Malaysia

A. Summary

CRITERIA MET:	Criterion i) trade in an endangered species and criterion v) high volume of trade in a globally threatened species.
GLOBAL STATUS:	Globally Critically Endangered (2018 assessment), with a decreasing population trend, on the basis of an estimated population decline over the last three generations (150-300 years) of over 80%.
INDONESIA: Responded to the consultation relating to the RST	*A. malaccensis* is found in western Indonesia, principally in Kalimantan and Sumatra. The species has been reported to occur at densities of 0.01-0.8 individuals/ha in the wild. An inventory of wild agarwood tree species populations has not been conducted, but populations in Indonesia were considered to be decreasing as a result of overexploitation, forest loss and land use change; the rate of decline is unknown. Indonesia has submitted CITES annual reports for all years 2013-2022 and published export quotas for wild specimens of the genus *Aquilaria* 2013-2016 and for the species *A. malaccensis* 2017-2022. Recent species-level quotas for 2022 and 2023 were 10% and 5% lower than the 2021 quota, respectively. Genus-level export quotas appear to have been exceeded in 2013-2016 (as reported by Indonesia and exporters) as do the species-level quotas in 2021 (as reported by Indonesia and exporters) and 2022 (according to Indonesia only). As reported by Indonesia, direct trade in *A. malaccensis* 2013-2022 principally comprised high volumes of wild-sourced chips (1.07 million kg), powder (53 728 kg), logs (49 644 kg), and timber (16 172 kg) traded for commercial purposes. Importers reported wild-sourced trade mostly consisting of 751 925 kg of chips, 74 491 kg of powder, and 38 243 kg of logs. Agarwood is treated as a non-timber forest product. Annual harvest and export quotas were reported to be determined for individual provinces based on standing stocks across “all types of population” (wild, assisted production and plantation); these therefore appear to be combined quotas that cover all production systems, but the situation requires further clarification. The exact methodology for setting quotas was not provided. Indonesia confirmed that agarwood from registered plantations is not subject to a quota, but also noted that not all owners of agarwood plantations have registered them; it is assumed that products from non-registered plantations are allocated source code W. Quotas for *A. malaccensis* were reported to have been lowered to encourage registration of stocks in plantations. Indonesia further stated that they are committed to decreasing the harvest quota for “wild” *A. malaccensis* by 40% in 2024, although the baseline year for the 40% reduction is unclear, and as noted above it is unclear whether individual quotas are set for different production systems. Approximately 3.4 million *A. malaccensis* trees are growing in home gardens and plantations, the majority of which are located in Sumatra and Kalimantan. Indonesia referred to “assisted production” of the species in their response, but the use of source code Y does not appear to have been considered to date.

PROVISIONAL CATEGORY:	The information provided suggests that the quota for wild specimens includes other production systems (plantations and assisted production). It seems likely that a large proportion of reported trade is in specimens from non-wild sources, and it is therefore difficult to assess the impact of wild-sourced trade on populations. Given the Critically Endangered status of the species, the decreasing population trend in Indonesia, the lack of a robust non-detriment finding, and the absence of a clear quota setting process for wild-sourced trade, categorised as **Action is needed.** Setting separate quotas for wild specimens and other production systems (sources A and Y), and ensuring that all quotas specify the terms that are exported from the country (e.g. chips, powder), seems a key requirement to monitor trade; Indonesia could therefore be requested to clarify the scope of the current quota, and in future, to consider setting term- and production system-specific quotas as outlined above.
MALAYSIA: Responded to the consultation relating to the RST	*A. malaccensis* is found in Peninsular Malaysia and Sabah, but its occurrence in Sarawak is unclear. A census of wild agarwood tree species populations has been conducted in Peninsular Malaysia only, however no numerical estimates of stems/ha could be located. In this region, the species is found in primary and logged forests, with populations in decline due to over exploitation and, to a lesser extent, habitat loss. No information on the status of the populations in Sabah and Sarawak could be located. Illegal trade was reported to be a country-wide problem, including within protected areas. Malaysia has submitted CITES annual reports for all years 2013-2021 but the report for 2022 has not yet been received. Malaysia published export quotas at the genus level for all years 2013-2023; direct exports did not appear to exceed any quota as reported by Malaysia and importers. Direct exports of *A. malaccensis* were mainly reported by importers and consisted predominantly of wild-sourced chips, powder, and timber traded for commercial purposes. Permit analysis indicated that Malaysia largely reported the same trade at the genus level, with the highest exporter-reported quantities in wild-sourced chips (720 194 kg) and powder (166 809 kg). Malaysia is in the process of implementing a conservation action plan for the species. Quotas were reported to be based on information on the standing stock of populations > 30cm diameter, but the exact methodology was not provided. Quotas have been lowered since 2021 to move towards a zero export quota for the *Aquilaria* spp., in order to "stabilize the wild population of the species". No permits to harvest specimens from the wild from Forest Reserves were reported to have been issued since 2015; exports of wild specimens since 2015 relate only to stockpiles. A large number of *Aquilaria* trees (at last a million) occur in plantations in Malaysia, but the use of source code Y does not appear to have been considered to date.
PROVISIONAL CATEGORY:	Malaysia has made efforts to reduce harvest and trade of wild specimens and has not allowed harvest from Forest Reserves since 2015. However, a high level of trade has been reported since 2015 (all reportedly from stockpiles), and it is not clear if any reported wild-sourced exports have come from assisted production (source code Y). Given the Critically Endangered status of the species, the decreasing population trend in Peninsular Malaysia, and the lack of a robust non-detriment finding and clear quota setting process, categorised as **Action is needed**.

	Malaysia has predominantly published genus-level export quotas for wild-sourced *Aquilaria* spp. in all years 2013-2023, and reported trade predominantly at the genus level over this period. To improve monitoring of trade in *A. malaccensis*, Malaysia could be requested to publish species-, term- and production system-specific quotas, and report trade at the species level.

B. RST background

Aquilaria malaccensis from all range States was previously included in the RST at PC12 (May 2002). Following a detailed review presented at PC14 (PC14 Doc. 9.2.2), the Plants Committee categorised Malaysia (Peninsular Malaysia and Sarawak) as 'urgent concern', India and Indonesia as 'possible concern', and Bangladesh, Bhutan, Myanmar, Thailand, the Philippines and the Malaysian state of Sabah as 'least concern'. Recommendations were made for Bangladesh, India, Indonesia, Malaysia, Singapore and Thailand, which were revised by the Secretariat in consultation with the Chair of the Plants Committee at PC15 (PC15 Doc.10.1.1 (Rev.1)).

Indonesia was asked to provide further information on its procedure for making non-detriment findings (with specific attention to the amount of *A. malaccensis* being harvested and traded within its quota, which included four other species that produce the highly valued aromatic resin known as agarwood) (PC15 Doc.10.1.1 (Rev.1)). **Malaysia** was asked to clarify its management and monitoring of *A. malaccensis* across different Malaysian jurisdictions, to provide further information on harvest levels and locations, to provide updated information on its national forestry inventory, and to establish a cautious quota (PC15 Doc.10.1.1 (Rev.1)). Malaysia was also recommended to convene a working group with relevant stakeholders to develop a reliable non-detriment finding methodology to monitor agarwood harvest and trade (PC15 Doc.10.1.1 (Rev.1)).

The species was removed from the process for Indonesia and Malaysia at SC54 (October 2006) as the recommendations were deemed to have been complied with (SC54 Doc.42).

C. Species characteristics

Biology: *A. malaccensis* is a large evergreen tree species (Harvey-Brown, 2018), reaching up to 40 m in height, and between 1.5 to 2.5 m in diameter (Kumar Borah *et al.*, 2012). The species is initially shade-tolerant, but requires more sunlight as it matures (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023); it occurs in primary and secondary forest habitats (Mohamad Ali *et al.*, 2016), up to 1000 m altitude (Kumar Borah *et al.*, 2012), and in rocky, sandy or calcareous soils, in areas near swamps and well drained slopes (Barden *et al.*, 2000). In a survey conducted by Abdurachman *et al.* (2009) (in CITES MA of Indonesia *in litt*. to UNEP-WCMC, 2023) in East Kalimantan (Berau), the average stem diameter growth was found to be 0.4 cm/year, increasing to 0.64 cm/year in large (>40 cm) class sizes.

A. malaccensis seeds are reported to be recalcitrant, with a short viability period (Tabin & Shrivastava, 2014), but high rates of germination have been observed in cultivation (Soehartono & Newton, 2001).A study of natural *A. malaccensis* populations in Indonesia found that seed production occurs at a variety of tree sizes >10 DBH, and peaks in trees with a DBH of approximately 40 cm, before starting to plateau and decline in larger trees (Soehartono & Newton, 2001). Individual trees can produce up to 10 000 seeds in a single fruiting season (Soehartono & Newton, 2001). In natural forests, 69% of *A. malaccensis* seedlings occurred within 5 m of the parent tree, suggesting that the "high reproductive potential" of *Aquilaria* spp. might be balanced by limited seed dispersal (Soehartono & Newton, 2001).

As with *A. crassna*, the species is harvested for its valuable aromatic resin, known as agarwood (Harvey-Brown, 2018; Lee & Mohamed, 2016).

Distribution: According to Lee & Mohamed (2016), *A. malaccensis* occurs in Bangladesh, Bhutan, India, Indonesia, Iran (Islamic Republic of), Malaysia, Myanmar, the Philippines, Singapore and Thailand; however, the population in India is thought to be extinct (Harvey-Brown, 2018).

Population status and trends: *A. malaccensis* was globally categorised as Critically Endangered in a 2018 IUCN assessment on the basis that the species is estimated to have undergone an 80% decline over the last three generations (c.150 years) as a result of overexploitation (Harvey-Brown, 2018). While the genus in general is noted to occur at low densities, *A. malaccensis* was reported to be the most abundant species (Thompson *et al.*, 2022).

Threats: *A. malaccensis* is considered to be primarily under threat from overexploitation for its agarwood (PC14 Doc. 9.2.2 Annex 2), although the species is also traded for its timber (see *Overview of trade and management* section). Land use change, forest fires and mining are also threats in parts of the species' range (CITES MA of Indonesia *in litt.* to the CITES Secretariat, 2023; Harvey-Brown, 2018).

The key destination markets for agarwood products are located in the Middle East (for oil, high quality chips and lesser quality products used in incense or bakhoor) and east Asia (for high quality incense products, exhausted powder, small solid wood products and medicinal products) (Thompson *et al.*, 2022). The price commanded by agarwood commodities can vary considerably, depending on the type and grade of the product (Thompson *et al.*, 2022). Premium grade agarwood chips reportedly sold at prices up to USD 100 000/kg in 2020 (Ash, 2020 in: Thompson *et al.*, 2022), with agarwood oil reaching a price of USD 40 500/litre in 2021 (Oud Oil Trading, 2022 in: Thompson *et al.*, 2022). The total value of global sales of agarwood chips was estimated to be USD 30-32 billion in 2018 and is predicted to grow to USD 64 billion by the end of 2029 (Persistence Market Research, 2019 in: Thompson *et al.*, 2022). This expansion reportedly reflects continued demand from the Middle East, increasing demand for agarwood chips in the fragrance industry and the development of new agarwood products, which is expected to further boost demand (Persistence Market Research, 2019). Wild-sourced agarwood products tend to sell for a higher price than agarwood from an artificially propagated source, due to the improved quality of the resin that is derived from older trees (Thompson *et al.*, 2022).

Illegal harvesting and trade were considered to be major ongoing threats to agarwood-producing species (Thompson *et al.*, 2022). According to data from the UNODC World WISE Database, during the period 2007-2014, the greatest volumes of agarwood seizures originated from Indonesia and Malaysia, with major illegal trade flows extending from these source countries to Saudi Arabia and the United Arab Emirates (UNODC, 2016). Agarwood accounted for 0.6% of the total value of seized wildlife products globally between 2014-2018, positioning it among the top seized plant commodities by value (UNODC, 2020). The ease with which high-quality agarwood products can be trafficked via international flights makes it likely that a very small fraction of the illegal trade in agarwood-producing species has been detected (UNODC, 2016). Laundering of wild-sourced products through plantation operations was also noted to occur (UNODC, 2016).

Overview of trade and management: *A. malaccensis* was first included in CITES Appendix II as a species-specific listing on 16 February 1995; on 12 January 2005 it was included as part of the genus listing for *Aquilaria*. The annotation corresponding to the listing has changed multiple times but has been #14[25] since 12 June 2013.

According to the CITES Trade Database, global direct trade in *A. malaccensis* 2013-2022 predominantly consisted of 3.5 million kg of chips (30% wild-sourced and 70% artificially propagated) as reported by exporters. The main wild-sourced commodities in direct trade included nearly 1.1 million kg of chips, 53 738 kg of powder, 51 144 kg of logs, and 17 672 kg of timber, according to exporters. Notable quantities of wild-sourced sawn wood (23 559 kg) and wood products (18 935 kg) were reported by importers. Global direct exports were also reported at the genus level (*Aquilaria* spp.), which primarily comprised wild-sourced exports of 720 233 kg of chips, 166 810 kg of powder, and 81 755 kg of oil according to exporters. Direct trade in the species and at the genus level was mostly for commercial purposes.

D. Country reviews

Indonesia

Distribution: *A. malaccensis* was reported to be found naturally in western Indonesia, in Kalimantan and Sumatra (CITES MA of Indonesia, *in litt*. to UNEP-WCMC, 2023; Harvey-Brown, 2018). Herbarium records indicate it is also found on the small islands of Banka, Belitung, Karimum and Singkep near Sumatra (CITES MA of Indonesia, *in litt*. to UNEP-WCMC, 2023). The species is found in State forests (both conservation and production areas) and community forests (e.g. in Siak Regency, Riau Province and Bengkulu Tengah, Bengkulu Province), and in non-forest areas (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). The estimated extent of occurrence (EOO) for *A. malaccensis* in the country is 1 874 074 km^2 (calculated on the basis of herbarium specimen records), whilst the area of occupancy (AOO) is estimated to be only 364 km^2 (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023).

Figure 6.1: Extent of Occurrence (EOO) and Area of Occupancy (AOO) of *A. malaccensis* in Indonesia. Source: CITES MA of Indonesia (*in litt*. to UNEP-WCMC, 2023).

Population status and trends: Although a country wide survey of wild populations and plantations has not been conducted in Indonesia (Turjaman, 2022 in Thompson *et al*. 2022), the CITES MA of Indonesia

[25] All parts and derivatives except: a) seeds and pollen; b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) fruits; d) leaves; e) exhausted agarwood powder, including compressed powder in all shapes; and f) finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings.

(*in litt.* to UNEP-WCMC, 2023) reported that wild populations of *A. malaccensis* in western Indonesia are assumed to be decreasing, as its natural habitat is also decreasing.

According to the MA of Indonesia (*in litt.* to UNEP-WCMC, 2023), research over the past 15 years found wild population densities in western Indonesia to range between 0.01 and 0.8 individuals/ha (Table 6.1), with fewer mature stands than younger stands. In earlier surveys conducted in Sumatra and East and West Kalimantan, tree density was estimated at approx. 0.4 tree/ha and 1 tree/ha, respectively (Partomihardjo & Semiadi, 2006; Soehartono & Newton, 2001; Soehartono, 1999); the species was considered by Soehartono & Mardiastuti (1997) to be depleted in Sumatra and East Kalimantan, and virtually extinct in West Kalimantan.

Table 6.1: Population densities for *A. malaccensis* reported from natural populations in Indonesia, reproduced from information provided by the CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023).

Study	Location (land status)	Population density (individuals/ha)
Abdurachman *et al.* (2009)	Labanan research plot, Berau, East Kalimantan (state forest)	0.61
Pribadi (2009)	Kutai National Park, East Kalimantan (conservation area)	0.01
Partomihardjo *et al.* (2010)	PLG Bengkulu, Sumatra (state forest)	10 (density estimate includes both *A. malaccensis* and *A. beccariana*)
	Tahura Bengkulu Forest Park, Bengkulu, Sumatra (conservation area)	11 (density estimate includes both *A. malaccensis* and *A. beccariana*)
Yulizah *et al.* (2019)	Gunung Maras National Park, Bangka Belitung Islands	0.8

Threats: The indiscriminate harvesting of *Aquilaria* spp. to supply global demand for agarwood is regarded as a substantial threat facing *A. malaccenis* in Indonesia; the species' IUCN assessment noted that this had resulted in "estimated decline of over 80%" in the country, but the data this estimate is based on are unclear (Harvey-Brown, 2018).

According to the CITES MA of Indonesia (*in litt.* to the CITES Secretariat, 2023), wild agarwood is mostly harvested from community areas from trees with stems with a diameter in excess of 20 cm. The major threats facing wild *A. malaccensis* populations were reported by the MA to be illegal harvest (the country has historically been a major source of illegally harvested agarwood (UNODC, 2016), see *Overview: threats* section), and the conversion of lowland forest areas into palm oil plantations, mining concessions, farms and settlements. Although the MA stated that illegal harvesting activity had been reported by local communities in forest areas, the threat posed by illegal harvest and habitat loss was considered by the MA to be under control, owing to an increased number of forest ranger patrols, support for cultivation efforts, and recent changes in market conditions (e.g. lower returns on illegally harvested agarwood). Forest fires were also reported as a threat to the species (Harvey-Brown, 2018; Soehartono & Mardiastuti, 1997; Turjaman, 2022 in: Thompson *et al.* 2022).

Trade: Indonesia has submitted CITES annual reports for all years 2013-2022. Indonesia published export quotas for the genus *Aquilaria* 2013-2016 and for the species *A. malaccensis* 2017-2022 (Table 6.2). The species-specific 2022 and 2023 quotas were 10% and 5% lower than the quota for 2021, respectively. The published quotas did not specify specific terms and Indonesia confirmed that quotas referred to "all kinds of products" (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). Quotas for 2013-2019 were published with the description "agarwood", but this was not included in quotas published from 2020.

Direct exports of *A. malaccensis* appeared to exceed the species-level quota in 2021 (as reported by Indonesia and exporters) as well as 2022 (according to Indonesia only) when considering all wild-sourced trade terms reported by weight. Additional remarks included in Indonesia's annual reports 2021-2022 noted that all powder reported in 2021 and 2022 (9500 kg and 10 000 kg, respectively) was "waste from agarwood oil processes" with "no quota allocated"; if this trade is excluded from consideration of trade reported by Indonesia that is relevant to annual export quotas, the quotas for 2021 and 2022 do not appear to have been exceeded. Direct exports of all *Aquilaria* spp. appeared to exceed the genus-level quotas 2013-2016, as reported by Indonesia and exporters, when considering all wild-sourced terms reported by weight (Table 6.2). Excluding exports described as "waste from agarwood oil processes" in Indonesia's annual reports reduced the total quantity by approximately 50% in each year 2013-2015 and by 34% in 2016, however the genus-level quotas published 2013-2016 still appear to have been exceeded.

In its response the consultation relating to the RST, the CITES MA of Indonesia (*in litt.* to the CITES Secretariat, 2023) provided a summary of annual quotas and exports of *A. malaccensis* (as recorded in the CITES Trade Database and as submitted in the country's annual reports) for the years 2017-2021(see PC27 Doc. 15.4 Annex 1); these quantities appear to exclude reported direct exports of powder and are therefore lower than the quantities provided in Table 6.2, which as noted above summarises wild-sourced trade in all terms by weight as recorded in the CITES Trade Database.

Direct trade in *A. malaccensis* from Indonesia 2013-2022 principally comprised high volumes of wild-sourced chips (1.07 million kg according to Indonesia), powder (53 728 kg), logs (49 644 kg), and timber (16 172 kg) traded for commercial purposes (Table 6.3). Importers reported wild-sourced trade mostly consisting of 751 925 kg of chips, 74 491 kg of powder, and 38 243 kg of logs. Trade was highest in 2013 and fluctuated throughout the decade, with 2022 levels of trade in wild-sourced chips being around 60% of the trade level in 2013. Additionally, artificially propagated chips were exported in substantially higher numbers in 2022 than in previous years. As reported by Indonesia, the major importers of wild-sourced chips and powder were Singapore (33% of trade in kg), Saudi Arabia (29%), Republic of Korea (16%), and India (12%). Major importers of wild-sourced logs and timber were Singapore (42% of trade in kg), China (34%), and Taiwan Province of China (18%).

Indirect trade in *A. malaccensis* originating in Indonesia also principally comprised wild-sourced chips (579 052 kg according to re-exporters), powder (26 771 kg) and timber (19204 kg) traded for commercial purposes, with notable levels of trade in artificially propagated (20 399 kg) and pre-Convention (42 492 kg) chips (Table 6.4). The majority of wild-sourced trade was re-exported via Singapore (66% of trade by weight according to re-exports) and India (19%); artificially propagated trade was mostly re-exported via United Arab Emirates (66%), Singapore (15%), and Saudi Arabia (13%).

Direct trade reported at the genus level was mostly reported by importers for commercial purposes, consisting primarily of 4231 kg of wild-sourced chips and lower levels of trade in artificially propagated chips (432 kg) and sawn wood (125 kg), as well as wild-sourced sawn wood (119 kg). Indirect trade in *Aquilaria* spp. originating from Indonesia and reported at the genus level predominantly comprised 16 915 kg of wild-sourced chips as reported by re-exporters (35 225 kg according to importers) traded for commercial purposes. Major re-exporters of wild-sourced chips were Taiwan Province of China, Singapore, and Malaysia.

Table 6.2: CITES export quotas published for *Aquilaria* spp. (2013-2016) and *A. malaccensis* (2017-2022) from Indonesia, and global wild-sourced direct exports reported by weight (all trade terms) for all *Aquilaria* spp. (2013-2016) and *A. malaccensis* (2017-2022) as reported by Indonesia and importers. Trade data for 2023-2024 are not yet available. Hyphens indicate years where quotas were not published or where trade data are not yet available. Apparent quota excesses are indicated by **bolded** quantities.

Wild	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Quota (kg)	178500* (agarwood)	178500* (agarwood)	178500* (agarwood)	178500* (agarwood)	178500 (agarwood)	151725 (agarwood)	116069 (agarwood)	101000	101000	90900	95950	-
Reported by exporter	**1488567***	**1323063***	**1181555***	**1033268***	105736	90948	113468	98241	**107800**	**102946**	-	-
Reported by importer	**1020220***	**407369***	**228093***	**287883***	65738	86197	103010	53624	**134864**	51248	-	-

*Quotas published for the genus *Aquilaria*; quantities reported by exporter and importer reflect trade in all *Aquilaria* spp.

Table 6.3: Direct exports of *A. malaccensis* from Indonesia, 2013-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Term, unit, source, and purpose combinations reported at total quantities of less than 10 by both exporters and importers have been excluded.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
carvings	kg	T	W	Exporter											
				Importer		321									321
chips	kg	Q	A	Exporter							20				20
				Importer											
		T	A	Exporter	25405	2000	55		3000		7887	4504		128502	42851
				Importer	25495						5807		2500	15005	33302
			W	Exporter	154272	127863	87034	112230	105736	86448	106179	98116	96838	92695	1067411
				Importer	105071	55381	46524	58670	63108	84147	102535	52758	126315	41285	735793
		-	W	Exporter											
				Importer			16132								16132
	number of specimens	T	A	Exporter											
				Importer								2000			2000
			W	Exporter											
				Importer		1810		350		2500	30528	64880			100068
derivatives	kg	Q	A	Exporter							151				151
				Importer											
		T	W	Exporter											
				Importer								866	200		1066

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
live	kg	T	W	Exporter											
				Importer	825										825
logs	kg	T	A	Exporter	1088										1088
				Importer											
			W	Exporter	23240	19894	5310	1100					100		49644
				Importer	14120	13254	7040	1000	2630				199		38243
powder	kg	T	A	Exporter	2900										2900
				Importer	2900										2900
			W	Exporter	24728	2500	2500			4500			9500	10000	53728
				Importer	54978					2050			3000	9963	74491
sawn wood	kg	T	W	Exporter											
				Importer	14549										14549
stems	kg	T	W	Exporter										251	251
				Importer											
timber	kg	T	A	Exporter			200								200
				Importer	500										500
			W	Exporter		4192	1958	1250			7288	125	1359		16172
				Importer	2802	3941	2092	800			475		150		10260
unspecified	kg	-	-	Exporter											
				Importer								6554			6554
wood product	kg	T	W	Exporter											
				Importer				85					500		585

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 6.4: Indirect exports of *A. malaccensis* originating in Indonesia, 2013-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable. Term, unit, source, and purpose combinations reported at total quantities of less than 10 by both re-exporters and importers have been excluded.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
carvings	kg	T	W	Exporter											
				Importer		458									458
chips	kg	S	W	Exporter											
				Importer	10										10
		T	A	Exporter	980	850	745	59		155	8181	1877	2774	4778	20399
				Importer	721		147		690	155	8181	1050	544	254	11742
			O	Exporter	32210	2225	33		362	2930	718	1365	1588	1063	42492
				Importer	17626	3600				2588	218	50	60	72	24214
			U	Exporter											
				Importer									45		45
			W	Exporter	59421	63391	38374	83593	113654	54180	52787	44209	29694	39748	579052
				Importer	41010	31543	7879	17805	83393	35115	40012	44089	22772	30492	354110
		-	W	Exporter											
				Importer			8576								8576
			-	Exporter						687					687
				Importer											
	number of specimens	T	W	Exporter	34		1400								1434
				Importer		15		312	225		810	20			1382
derivatives	kg	T	W	Exporter	8	0.0001							853		861
				Importer							15				15
live	kg	T	W	Exporter											
				Importer				70							70
logs	kg	T	A	Exporter									40		40
				Importer											
			O	Exporter	32							755	280		1067
				Importer	16										16
			W	Exporter		5208	546	213			3001		300	20	9287
				Importer			289	255	679	97	45	2761		20	4146
medicine	kg	T	O	Exporter	21	3									24
				Importer											
			W	Exporter	9	0.4	6	0.9	1				0.03	0.05	18
				Importer	6								0.01	0.1	6

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
oil	kg	T	A	Exporter											
				Importer									48	15	63
			O	Exporter	3	5			7	4			7	10	36
				Importer	1				1				2	1	5
			W	Exporter	733				1				3		737
				Importer	733				78				3		814
	l	T	O	Exporter	78	22		51	40						191
				Importer	78										78
			W	Exporter	5		26	106	90	154	92	40	5	57	577
				Importer	5	0.2			1	144	94		45		289
	number of specimens	T	O	Exporter		108									108
				Importer											
powder	kg	T	O	Exporter	56	0.7		1	5	1000		510			1573
				Importer	5	30									36
			W	Exporter	6818	7332	1470	279	139	35	642	7301	1012	1744	26771
				Importer	7295	1980	1290	51		183	20093	222	12801	1315	45229
sawn wood	kg	T	W	Exporter											
				Importer	571	558	117								1246
timber	kg	T	A	Exporter			500								500
				Importer											
			O	Exporter											
				Importer			33								33
			W	Exporter	6836		9043	1169	869	654	296	306		30	19204
				Importer	80	7	2995		41	1315					4438
unspecified	kg	T	W	Exporter			623								623
				Importer											
wood product	kg	T	W	Exporter											
				Importer				60			3				63

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management: Except for the section on Legislation, sections below summarise information provided by the CITES MA of Indonesia in response to the consultation relating to the RST (*in litt.* to the CITES Secretariat, 2023; *in litt.* to UNEP-WCMC, 2023), unless otherwise stated.

Legislation: Several environmental and forestry regulations coordinate the management of wild species in Indonesia, including:

- Government Regulation No. 7/1999 on preserving flora and fauna species, which classifies protected and unprotected species (*A. malaccensis* is not classified as a protected species);

- Government Regulation No. 8/1999 on the exploitation and use of non-protected wild plants and animals; exploitation from the wild should be conducted in a controlled manner and whist considering the species diversity and ecosystem balance; domestic, export or import trade of wild fauna and flora may only be conducted by business entities recommended by the Forestry Minister (Chapter V), and is subject to the establishment of annual harvesting quotas (Chapter XI);

- Government Regulation No.23/2021 regarding the implementation of forestry management, and Forestry Decree No. 447/Kpts-II/2003 on the harvest and distribution of specimens of wild plants and animals, which determines that the harvest of agarwood can take place from production forests and other land uses (where strict control of the quota system is in place), and must be carried out outside protected areas (Art 5).

Indonesia's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Quotas: As noted above, Government Regulation No. 8/1999 stipulates that the exploitation of non-protected wild plants is subject to the establishment of annual harvesting quotas; these are set by the Management Authority based on recommendations made by the Scientific Authority. Quotas for *A. malaccensis* were reported to be determined for individual provinces based on standing stocks across "all types of population" (wild, assisted production and plantation), taking into account the harvest location and whether previous quotas have been fulfilled. They were reported to be distributed via harvest permits to domestic permit holders, who employ registered agarwood harvesters. The areas receiving the highest proportion of the harvest quota for *A. malaccensis* in 2023 according to Indonesia's quota book were Riau (44%), Kaltim (23%) and Kalbar (11%) (Decree N. 1/KSDAE/KKHSG/KSA.2/1/2023). According to this quota book, 100% of the national harvest quota is allocated for export (Decree N. 1/KSDAE/KKHSG/KSA.2/1/2023).

Because Indonesia's national harvesting quota appears to be based on a calculation of standing stocks across all types of production system, and the example of how the quota could be allocated provided by Indonesia includes reference to non-wild sources (see below), the national harvesting quota appears to be a combined quota that covers all production systems, though the situation requires further clarification. The Forest Protection and Nature Conservation Regulation (No. P.25/IV-SET/2014) stipulates that agarwood from registered plantations is not subject to a quota; however, Indonesia noted that the registration process is onerous and is not always taken up, particularly where people own a small number of planted trees. It is therefore possible that agarwood products from registered farmers have been exported using source code A, and that products from unregistered farmers have been exported using source code W, but this requires further verification. Indonesia did not indicate whether the use of source code Y (assisted production) had been considered.

To encourage registration of standing stocks in plantations and farmlands, the Indonesian MA noted that the “quota” (assumed to refer to the overall national harvesting quota, which registered plantations are excluded from) would be reduced over a five-year period. The span of this five year period is unclear; as mentioned in the *Trade* section, Indonesia’s export quota for *A. malaccensis* in 2022 was 10% lower than the quota for 2021, however in 2023 the quota was only 5% lower than the 2021 quota. Indonesia also stated that it had made a commitment to decrease the quota for wild *A. malaccensis* by 40% in 2024, although the baseline for the 40% reduction was not provided, and as previously noted, it is unclear whether there is a quota that applies exclusively to wild specimens.

It was not possible to confirm whether any attempts have been made to distinguish products that have been derived from the wild, assisted production or plantation throughout the supply chain. Indonesia clarified that there are difficulties distinguishing the source of finished products, but noted that wild-sourced chips have irregular shapes and a dark colour; chips derived from plantation or assisted production tend to be more regular in shape, and powder is generally produced from plantations or assisted production. Given that there have been no reported exports of powder other than from wild sources since 2013 (Table 6.2), it seems probable that exports of specimens from non-wild sources have been reported by Indonesia as wild-sourced.

It is additionally not clear how this (potentially) combined quota is established based on the number of wild stands or the production levels expected within different locations from plantations. However, Indonesia provided examples of how the annual quota could be allocated. A tree of DBH 26 cm and height 15 m would weigh 191 kg, or 102.57 kg dry weight[26] (adjusting for known water content of 46.3%, based on Wiriadinata *et al.*, 2010). Thus, the 2021 quota of 101 000 kg represents 984.7 trees, that could be allocated to either 0.89 ha of monoculture plantation (assuming 1111 individual trees/ha) or 2.95 ha in a mixed plantation (also referred to as “assisted production” assuming 333 individual trees/ha; see *Plantations and assisted production* section). Further assuming that every log contains 10% resin from the dry weight, the number of trees harvested per the quota would be 9847 from 8.9 ha of monoculture or 29.5 ha of mixed plantation (Table 6.5). It was noted that the 2021 quota could be met by plantations in Sumatra only.

Table 6.5: **Illustrative example of how the national harvesting quota could be met based different** production systems. Source: CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023).

Year	Annual quota (kg)	No. of trees (dried weight, kg)	Area (for dried weight in ha)		With assumption only 10% resin per dried weight		
			Monoculture	Assisted production	No. of trees	Area (ha)	
						Monoculture	Assisted production
2021	101 000	984.7	0.89	2.95	9847.2	8.86	29.54

Plantations and assisted production: Given that the extraction of wild agarwood with high levels of resin was reported by Indonesia to require month-long trips of exploration into deep forest and require specialist skills, it is considered a high-cost activity. Conversely, agarwood trees planted in villages are highly accessible and many people in Sumatra and Kalimantan have planted them; the local government provided free seedlings during 2011-2012 to encourage planting.

Two types of plantations can be found in Indonesia: monoculture and mixed-tree plantations, where trees of *A. malaccensis* are planted together with rubber and palm oil trees. According to the figure

[26] Note that 26 cm DBH appears high compared to the estimated average diameter of *A. malaccensis* in plantations of 17 cm (see *Plantations and assisted production* section).

provided to Thompson *et al.* (2022) at the CITES agarwood workshop in 2022, 3.5 million *A. malaccensis* trees occur in home gardens and plantations in Indonesia; this figure aligns with the findings of Turjaman & Hidayat (2017), who estimated that c. 3.4 million trees of agarwood have been planted in Indonesia; 85% of plantations are thought to be located in West and North Sumatra and Kalimantan, with the remaining plantations in West-Central and East Java, Bali, Bangka Belitung, Riau and Aceh. Indonesia provided population density figures for "assisted production" plantations present a) in areas where agarwood trees are found with palm oil, rubber, pepper and other tree species in production areas; b) in home gardens; and c) on private land (see Table 6.6). In some cases, the origin of the seedlings was reported to be mother trees located in nearby forests.

Table 6.6: Population densities for *A. malaccensis* reported subject to "assisted production", reproduced from information provided by the CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023).

Study	Location	Land status	Population density (individuals/ha)
Partomihardjo *et al.* (2010)	Way Waya, Sendang Baru, Gunung Sugih Regency, Lampung Province, Sumatra	Cultivation area	10
Yulizah *et al.* (2019)	Pelangas Village, Bangka Barat Regency, Bangka-Belitong Province	Home garden	0.14
	Lubuk Pabrik Village, Bangka Tengah Regency, Bangka-Belitong Province	Home garden	4.1
	Serdang Village, Bangka Selatan Regency, BangkaBelitong Province	Home garden	2.7
Yulizah *et al.* (2022)	Perincit Village, Siak Indrapura Regency, Riau Province, Sumatra	Home garden	8.13
	Gosib Village, Siak Indrapura Regency, Riau Province, Sumatra	Home garden	0.58
Field inventory (2023)	Tanjung Terdana Village, Bengkulu Tengah Regency, Bengkulu Province, Sumatra	Private land	100

Plantation agarwood was reported by Indonesia to be harvested only when stems are 12-13 years old, with a typical diameter of 17 cm and 8-10 m in height; the MA reported that plantation techniques vary between farmers and the process of peeling, inoculation (to stimulate resin formation) and harvest could take place up to 7-8 times during a tree's life cycle. Thirty-one agarwood farmers located in Riau, South Sumatra, Bengkulu, Jambi, West and East Kalimantan were reported to be registered with the CITES MA; the amount of *A. malaccensis* tree stands is estimated to be around 309 000 trees/245.94 ha.

Protected areas: According to an analysis by the CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023), c. 11% and 12% of the suitable and moderately suitable habitat for *A. malaccensis,* respectively, can be found in conservation areas listed in the World Database on Protected Areas.

Illegal trade: No seizures involving *A. malaccensis* from Indonesia were reported within the TRAFFIC Wildlife Trade Portal 2013-2023 (TRAFFIC International, 2024).

Malaysia

Distribution: *A. malaccensis* was reported to be found in Peninsular Malaysia and Sabah (Chua *et al.*, 2016; Harvey-Brown, 2018). Accounts of the occurrence of the species in Sarawak are contradictory; the species was reported to be absent by Chua *et al.* (2016) and in need of confirmation in Sarawak by Sang (in Harvey-Brown, 2018), but is described on the Forest Department Sarawak website as "rare but widespread" (Forestry Department Sarawak, 2024). *A. malaccensis* is also listed in the Protected Plants list in the Sarawak Wildlife Protection Ordinance 1998.

Population status and trends: According to Thompson *et al.* (2022), the estimated wild population of agarwood trees in Malaysia (mostly of *A. malaccensis*) was 1.11 million stems based on a 2013 census. However, this figure aligns with the 1.1 million stems of *Aquilaria* estimated to be in Permanent Forest Reserves of Peninsular Malaysia by the Fifth National Forest Inventory (NFI-5) (carried out between 2010 and 2013) (Forestry Department Peninsular Malaysia, 2015), indicating that it may be a figure for Peninsular Malaysia only.

A. malaccensis specifically was reported to be widespread in Malaysia but to generally occur at low densities (Chua, 2008). The species was categorised as Vulnerable in the 2012 Malaysian Plant Red List (Peninsular Malaysia) (Chua *et al.*, 2016).

While no species-specific trends could be identified, Chua *et al.* (2016) assessed joint population trends for *A. malaccensis* and *A. hirta* using abundance data obtained from National Forest Inventories conducted across Peninsular Malaysia in 1991-1993 (NFI-3), 2002-2004 (NFI-4) and 2010-2013 (NFI-5). Their analysis revealed a decline in abundance, with the greatest losses taking place between the years 1993 and 2004; the study further estimated a potential loss of 89% of mature individuals across both species (Chua *et al.*, 2016). The authors also reported that more than 25% of agarwood trees (the majority with a DBH of >30 cm) present across several monitored study sites disappeared between 2011 and 2015, mainly due to illegal logging (Chua *et al.*, 2016). In addition, an in-depth analysis of demographic parameters at one of the study sites located in the state of Negeri Sembelan revealed a substantial decline in the population since 1987; with mortality rates consistently higher than recruitment rates at this site, it was projected that the population of these species would continue to decline in the future (Chua *et al.*, 2016).

Threats: In Malaysia, wild populations of *A. malaccensis* (and *Aquilaria* spp. in general) were reported to be severely affected by overharvesting (Chua *et al.*, 2016) and to a lesser extent to be affected habitat loss (Lau and Chua, 2012). According to Chua *et al.* (2016), habitat fragmentation had made the sites where *A. malaccensis* still occurs more accessible and had increased opportunities for harvesting. The authors noted that *A. malaccensis* had a scattered distribution in natural forests in Peninsular Malaysia with small population sizes; the NFI-5 was reported to show that the distribution of mature *A. malaccensis* and *A. hirta* trees in this part of Malaysia was "more scattered" than previously recorded (Chua *et al.*, 2016). Genetic analyses of 35 *A. malaccensis* populations distributed throughout Peninsular Malaysia revealed moderate levels of population differentiation, with some evidence for possible inbreeding depression in one of the sampled populations (Lenggor, Johor state) (Chua *et al.*, 2016); the authors of the study concluded that "gene flow between plants via seeds and/or pollen was probably more extensive and unhindered in the past before the populations become isolated".

Harvesting of *A. malaccensis* still reportedly occurs in protected areas in Malaysia, although the level of illegal harvest is unknown (Chua *et al.*, 2016).

Trade: Malaysia has submitted CITES annual reports for all years 2013-2021; the report for 2022 has not yet been received at the time of writing. Malaysia has published quotas at the genus level (*Aquilaria* spp.) in all years 2013-2023 for "woodchips, wood blocks and essential oils" (Table 6.7). The genus-level quota for Peninsular Malaysia and Sabah declined considerably over the decade from 200 000 kg in 2014 to 25 000 kg in 2023, and the quota for Sarawak was reduced to 100 kg in 2023 from 5000 kg in each year 2013-2022. Direct exports did not appear to exceed quotas based on total quantities of wild-sourced chips, logs, and oil reported in trade by Malaysia or importers. The CITES MA of Malaysia (*in litt.* to UNEP-WCMC 2023) reported that the proposed quota for 2024 (based on NFI-5) would be 5000 kg for Malaysia.

A permit analysis indicated that while Malaysia reported trade at the genus level, importers predominantly reported the same trade at the species level. Direct trade in *A. malaccensis* from Malaysia 2013-2022 was thus predominantly reported by importers, and included mainly wild-sourced chips (11 470 kg reported by Malaysia, 218 634 kg according to importers), powder (56 000 kg reported by importers only), and timber (1500 kg reported by Malaysia, 34 331 kg by importers) traded for commercial purposes (Table 6.8). Other notable levels of trade in the species included 1500 kg of wild-sourced logs reported by Malaysia, and wild-sourced wood products (18 350 kg) and sawn wood (9000 kg) reported by importers. In the past decade, direct exports of chips, powder, and timber were highest in 2013 as reported by importers, and have gradually declined. While minimal trade in artificially propagated *A. malaccensis* was reported over the decade, Malaysia reported direct exports of 8550 kg of artificially propagated chips in 2021.

Direct exports reported at the genus level by Malaysia primarily consisted of wild-sourced chips (720 194 kg), powder (166 809 kg), oil (81 755 kg), sawn wood (50 575 kg), and timber (29 209 kg) traded for commercial purposes. This trade peaked in 2013 and remained at high levels (>159 000 kg total for the aforementioned terms) through 2016 before declining gradually in later years. Major importers of wild-sourced chips, powder, oil, sawn wood or timber were Taiwan Province of China (43% of genus-level trade reported by kg), Singapore (23%) and Viet Nam (15%). Lower levels of artificially propagated specimens were reported in direct trade at the genus level throughout the decade, peaking in 2020 with 7053 kg of chips, 5020 kg of powder, and 207 kg of derivatives reported by Malaysia.

Indirect trade in *A. malaccensis* originating in Malaysia also principally comprised high volumes of wild-sourced chips traded for commercial purposes (356 273 kg according to re-exporters and 185 727 kg according to importers), with other notable levels of trade reported for derivatives, powder and timber (also principally wild-sourced and traded for commercial purposes) (Table 6.9).

Table 6.7. CITES export quotas for the genus *Aquilaria* ("woodchips, wood blocks and essential oils") published by Malaysia 2013-2024, and global direct exports for wild-sourced *Aquilaria* spp. chips, logs[27], and oil as reported by Malaysia and importers, 2013-2022. Hyphens indicate years where quotas were not published, or exporter CITES annual reports have not yet been received; trade data for 2023 and 2024 are not yet available. As the CITES Trade Database does not distinguish exports within country regions, trade quantities are presented at the national level.

Wild	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Quota (kg) Peninsular Malaysia and Sabah	200000*	200000	200000	150000	150000	150000	150000	150000^	150000^	50000^	25000^	-
Quota (kg) Sarawak	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	100	-
Total quota	205000	205000	205000	155000	155000	155000	155000	155000	155000	155000	25100	-
Reported by exporter	144169	189659	159732	121785	83215	62982	30943	9871	4060	-	-	-
Reported by importer	80899	37329	26401	14048	29135	15299	10364	3665	2665	3103	-	-

*Quota published at the species level for *A. malaccensis.* All trade in wild-sourced chips and oil in 2013 was reported at the genus level by Malaysia and as *A. malaccensis* by importers.
^Quota published for Peninsular Malaysia only.

[27] The CITES MA of Malaysia (*in litt.* to UNEP-WCMC, 2023) confirmed that it uses the trade terms chips and logs in relation to the "woodblocks" specified by the export quotas.

Table 6.8: Direct exports of *A. malaccensis* from Malaysia, 2013-2022. Quantities greater than one were rounded to the nearest whole number, where applicable. Hyphens indicate years where exporter annual reports have not yet been received.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
carvings	kg	T	W	Exporter										-	
				Importer		1900									1900
		-	-	Exporter										-	
				Importer	731										731
chips	kg	T	A	Exporter									8550	-	8550
				Importer	1	200		105	38	1	5	2	20	30	402
			W	Exporter				370					2550	-	2920
				Importer	80899	37329	23046	13975	29108	15296	10148	3604	2640	2590	218634
		-	W	Exporter										-	
				Importer			55								55
derivatives	kg	T	A	Exporter										-	
				Importer				10							10
dried plants	number of specimens	S	A	Exporter										-	
				Importer	1										1
extract	kg	T	A	Exporter										-	
				Importer	6										6
live	number of specimens	T	D	Exporter					50					-	50
				Importer											
logs	kg	T	W	Exporter									1500	-	1500
				Importer			3300				73		20		3393
medicine	kg	T	A	Exporter										-	
				Importer							50				50
oil	kg	T	A	Exporter									0.1	-	0.1
				Importer					28	25		23			76
			W	Exporter									10	-	10
				Importer				73	27		0.006	0.5	3	12	115
	l	P	I	Exporter										-	
				Importer			0.003								0.003
		T	A	Exporter										-	
				Importer					12		0.06				12
			W	Exporter									3	-	3
				Importer	83	90	164	100	141	57	10		3		648

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
powder	kg	T	A	Exporter										-	
				Importer						1			10		11
			U	Exporter										-	
				Importer					3000		3000				6000
			W	Exporter										-	
				Importer	42000	14000									56000
sawn wood	kg	T	W	Exporter										-	
				Importer	9000										9000
timber	kg	Q	W	Exporter										-	
				Importer		1320									1320
		T	W	Exporter									1500	-	1500
				Importer	13652	10691	3738	2900	1600			250	1500		34331
wood product	kg	T	A	Exporter									11	-	11
				Importer											
			D	Exporter								643		-	643
				Importer											
			W	Exporter										-	
				Importer				18350							18350

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 6.9: Indirect exports of *A. malaccensis* originating in Malaysia, 2013-2022. Quantities greater than one have been rounded to whole numbers, where applicable. Term, unit, source, and purpose combinations reported at total quantities of less than 30 by exporters and importers have been excluded.

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
chips	kg	T	A	Exporter							298				298
				Importer											
			O	Exporter		7			66	5	276	17	410	1850	2630
				Importer								796	503	1850	3149
			W	Exporter	56584	60957	27101	39445	26230	13631	32836	22933	36543	40013	356273
				Importer	30994	7667	12516	18043	7563	6581	25910	9675	23404	43374	185727
	number of specimens	T	W	Exporter	300			1200							1500
				Importer		2416									2416
derivatives	kg	T	W	Exporter	922	11	4								937
				Importer	88										88
	number of specimens	P	W	Exporter	312										312
				Importer											
		T	W	Exporter	14273										14273
				Importer	664										664
live	kg	T	W	Exporter											
				Importer			57								57
logs	kg	T	O	Exporter	46								300		346
				Importer											
			W	Exporter		4373			42		0.8				4416
				Importer				997			12	9		5895	6914
oil	kg	T	A	Exporter											
				Importer						38			1		39
			W	Exporter	248	246	1502	459	342	549	65	4	340	34	3789
				Importer	945	70	393	162	148	2763	24	0.6	3	2	4509
	l	T	W	Exporter	29	151	258	139	104	201	23	11	5	7	928
				Importer	4	7	0.03	34	26	73	37		3		183
powder	kg	T	O	Exporter								500	1000		1500
				Importer									1000	1300	2300
			W	Exporter	1845	143	46	2	1000		33	379	2	300	3749
				Importer	1501	1100		2000	1000	5000	2871	961	502		14935
sawn wood	kg	T	W	Exporter											
				Importer	512	1927	70								2509

Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
timber	kg	T	W	Exporter	1579		2385	128	22	5415	1314	456	49	12717	24064
				Importer	101	77	118	4		6000	2676	453			9430
unspecified	kg	T	W	Exporter			3346								3346
				Importer											
wax	kg	T	W	Exporter			51								51
				Importer											

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation:

- The Forestry Department Peninsular Malaysia (FDPM) and the State Forestry Departments coordinate forest management in **Peninsular Malaysia** (Lim, 2023). The National Forestry Act 1984 (Act No. 313, Amended 1993) treats agarwood (or karas) as minor forest produce[28] (Second Schedule, Sec. 2, Part B). The taking of forest produce originating from a permanent reserved forest or State land makes it the property of the State, and therefore subject to the granting of a licence by the State Authority. Since agarwood is considered minor forest produce, silvicultural parameters used in forest management (e.g. annual allowable cut, minimum cutting diameter 45 cm DHB, retention of mother trees) are not applied in Peninsular Malaysia (Chua *et al.*, 2016). No form of harvesting is permitted in protected areas (Wildlife Conservation Act, 2010 (Act No. 716)).

- The Sabah Forestry Department is the authority responsible for forest management in **Sabah** (Ministry of Energy and Natural Resources, 2021). According to Teckwyn & Anak (2010), the Sabah Forestry department classified *A. malaccensis* as a "prohibited species" in 2004, to be retained inside Forest Reserves under the Forest Enactment 1968 (the relevant legislation could not be located to verify). Similarly, the CITES MA of Malaysia (*in litt.* to UNEP-WCMC, 2023), reported that harvest of *A. malaccensis* in the wild is prohibited in the region. Harvest from National Parks and Nature Reserves in Sabah is prohibited by the Parks Enactment 1984 (No. 6 of 1984).

- In **Sarawak**, the Wildlife Protection Ordinance of 1998, which provides for the protection, management and conservation of species, lists *A. malaccensis* as a Protected Plant species that may only be harvested and exported under licence. The Wildlife Protection Ordinance of 1998 also prohibits any taking of any form of forest produce in three types of protected areas, also known as "Totally Protected Areas": national parks, wildlife sanctuaries and nature reserves.

Malaysia's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Quotas: The CITES MA of Malaysia (*in litt.* to UNEP-WCMC, 2023) stated that licences to harvest *Aquilaria* spp. from the wild in Forest Reserves have not been issued since 2015. Additionally, in view of the government's commitment to reach a zero export quota from the wild in the near future, export quotas for *Aquilaria* spp. have been gradually decreased since 2021 (see *Trade* section), "in recognition of the need to stabilize the wild population of *A. malaccensis*" (CITES MA of Malaysia *in litt.* to UNEP-WCMC, 2023). Trade since 2015 was reported to be from stockpiles harvested from the wild with permits issued prior to 2015 (CITES MA of Malaysia *in litt.* to UNEP-WCMC, 2023). The MA also reported that since 2015, quotas were based on the findings of the National Forest Inventories (Peninsular Malaysia), and calculated based on the "the standing stock (diameter > 30cm; excluding protected forest) and cutting cycle of 50 years" (CITES MA of Malaysia *in litt.* to UNEP-WCMC, 2023).

[28] From the National Forestry Act 1984, Second Schedule, Part B- Minor Forest Produce: *A minor forest produce shall comprise all other produce not included as major forest produce*. Major forest produce includes round timber, poles, fuelwood, charcoal and rattan.

Chua *et al.* (2016) reported that any agarwood specimen that is removed from a permanent Forest Reserve or State land should be accompanied by a mandatory removal (licence) pass; the removal pass is also needed when applying for a CITES export permit, allowing the CITES authorities to monitor the harvest process.

Plantations: *A. malaccensis* is reported to be cultivated in monoculture or crop rotation systems (e.g. fruit trees) in village/community gardens (Chua *et al.*, 2016; Harvey-Brown, 2018). Seedlings of 10-15 cm in height can be collected from mother trees, and are transplanted when they reach heights of 60-90 cm (Thompson *et al.*, 2022). To reduce the harvest pressure on wild seeds for plantations, and to preserve genetic diversity, two *A. malaccensis* arboreta were established in Peninsular Malaysia under a CITES Tree Species Programme project, in the Pahagan and Selangor states (CITES MA of Malaysia *in litt.* to UNEP-WCMC, 2023).

According to Chua *et al.* (2016), commercial nurseries and plantations of *A. malaccensis* must be registered with the Malaysian Timber Industry board (the CITES MA of Malaysia for timber species); in Peninsular Malaysia 53 companies/individuals were reported to be registered with the authority. Figures on the extent of plantations in Malaysia vary; c. one million trees of *Aquilaria* spp. (mainly *A. malaccensis*, *A. crassna* and *A. subintegra*) occurring within an area of c. 980 ha. were reported to the CITES Asian regional workshop on agarwood 2015, while in 2014, the estimated number of agarwood trees, "mostly *A. malaccensis*"', in plantations was approx. 1.5 million trees across 2500 ha (Malaysia CITES website in: Thompson *et al.*, 2022). Chua *et al.* (2016) reported that the plantation industry was facing challenges due to the lack of quality planting stock, lack of a readily available processing chain and high input costs.

Conservation Action Plan: In 2016, the Government of Malaysia published a Conservation Action Plan for *A. malaccensis* in Peninsular Malaysia under an ITTO-CITES project (CITES MA of Malaysia *in litt.* to UNEP-WCMC, 2023); the action plan contains six objectives to be achieved over a five-year period to enhance the conservation of the species (Chua *et al.*, 2016). Table 6.10 provides a summary of the status of some of the actions listed under the Conservation Action Plan, according to an undated CITES Tree Species Programme project report.

Table 6.10: Summary of the status of actions listed under the Conservation Action Plan for *A. malaccensis* in Peninsular Malaysia, based on an undated CITES Tree Species Programme project report.

Conservation Action Plan Objective	Action	Status
Objective 1: Ensure that sufficient numbers of representative wild populations are conserved throughout its range	1.1.1 Identify at least five populations in each of the geographical regions of Kedah-Perak and Kelantan Johor	Completed
Objective 2: Enhance resource management and monitoring in the Permanent Forest Reserves (PFRs)	2.1.1 Conduct detailed inventory of karas populations at periodic intervals at State level	"Fifth National Forest Inventory for Peninsular Malaysia" – therefore assumed completed
	2.1.2 Determine, from the inventory, maximum harvest quantity allowed at the state level	As above
	2.1.3 Assess regularly whether the harvest quota reflects sustainability of the resource	Export quota revised accordingly
	2.1.4 Analyse, assess and review regularly harvest data in removal passes	Data shared among agencies
Objective 3: Enhance the production of artificially propagated *A. malaccensis*	-	No updates provided
Objective 4: Enhance research and development related to in situ and ex situ conservation and selection for superior stocks	4.1.2 Designate and establish suitable areas in relevant states as karas arboretum to support gene banks	Project proposal submitted
Objective 5: Enhance enforcement at national and state levels	5.1.2 Apply DNA profiling technologies for identification of species, population and individuals	Technologies have been developed by Forest Research Institute Malaysia
	5.1.3 Enhance enforcement capabilities, assets and manpower resources in respective agencies	Number of successful raids over the years increased
Objective 6: Enhance the enabling factors to improve the resilience of extant populations to harvesting	-	No updates provided

Protected areas: No specific occurrence records for *A. malaccensis* in protected areas were located; however, illegal harvesting was reported to have taken place in several protected areas in Peninsular Malaysia between 2004 and 2014, including in Belum Forest Reserve, Endau Rompin National Park, Kalabakan Forest Reserve, Panti Forest Reserve and Penang National Park (Chua *et al.*, 2016).

Illegal trade: Two seizures involving *A. malaccensis* agarwood were reported in the TRAFFIC Wildlife Trade Portal 2013–2023 (TRAFFIC International, 2024); in both cases, the shipments also contained specimens of other species. The country of origin, types and quantity of the products seized in Malaysia were not specified. Chua *et al.*, (2016) considered illegal harvesting of *A. malaccensis* in Peninsular Malaysia "a significant national problem", and Thompson *et al.* (2022) reported that illegal harvest of agarwood continues to take place across the whole country.

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

Illegal harvest

Illegal harvest of *A. malaccensis* has been noted to be a concern in both Indonesia and Malaysia.

Issuance of quotas and reporting of trade at the genus level

Indonesia: Based on the information provided, there is uncertainty regarding whether Indonesia's CITES export and harvest quotas are for wild-sourced specimens only, or represent a combined quota for wild-sourced specimens as well as specimens produced from plantations and using assisted production. In accordance with Res. Conf. 14.7 (Rev. CoP15), quotas should be established for wild-sourced specimens unless otherwise stated. Indonesia could be requested to clarify the scope of the current quota, and in future, to consider setting quotas for wild specimens and other production systems (sources A and Y), ensuring that all quotas specify the terms that are exported from the country (e.g. chips, powder).

Malaysia: Malaysia has predominantly published genus-level export quotas for wild-sourced *Aquilaria* spp. in all years 2013-2023, and reported trade predominantly at the genus level over this period; as such, trade data for *A. malaccensis* are mostly limited to importer-reported data. To improve monitoring of trade in *A. malaccensis*, Malaysia could be requested to publish species-, term- and production system specific quotas, and report trade at the species level.

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Gyrinops spp.: Indonesia and Papua New Guinea

A. Summary

CRITERIA MET:	Criterion ii) sharp increase in global trade, and criterion iii) sharp increase in trade from Indonesia.
GLOBAL STATUS:	Nine species of *Gyrinops* are recognised by Kew's Plants of the World Online, of which seven occur in Indonesia and Papua New Guinea: *G. caudata* (VU, 2021 assessment) *G. decipiens* (provisionally assessed as EN) *G. ledermanii* (EN, 2020 assessment) *G. moluccana* (provisionally assessed as EN) *G. podocarpus* (provisionally assessed as EN) *G. salicifolia* (EN, 2021 assessment) *G. versteegii* (provisionally assessed as EN)
INDONESIA: Responded to the consultation relating to the RST	Seven *Gyrinops* species occur in Indonesia, with *G. versteegii* being the most widely distributed species. Although a full census of wild agarwood species has not been conducted, the genus is reported to generally occur at low densities (2 trees/ha), and populations of *G. caudata*, *G. ledermanii*, *G. salicifolia* and *G. versteegii* are suspected to be decreasing globally because of overexploitation. Surveys of *G. versteegii* conducted at a limited number of sites in Indonesia suggest that few mature trees remain; this has consistently been attributed to overexploitation. Indonesia has submitted CITES annual reports for all years 2013-2022 and published quotas at both genus-level (*Gyrinops* spp. 2013-2016 and 2021-2023) and species-level (*G. versteegii* 2017-2022 and *G. decipiens* in 2020 only). Quotas at the genus level appear to have been exceeded according to Indonesia and importers in 2021-2022, and those for *G. versteegii* appear to have been exceeded in 2020-2021 as reported by Indonesia and 2020-2022 as reported by importers. Additional information in the remarks of Indonesia's annual reports suggest that the quota for 2021 may not have been exceeded, and that the 2022 quota excess could be reduced. Direct trade in all *Gyrinops* spp. from Indonesia 2013-2022 largely comprised high volumes of wild-sourced chips (334 146 kg) and powder (887 061 kg) traded for commercial purposes as reported by Indonesia. The only trade reported at the species level was for *G. versteegii*, predominantly as 132 618 kg of wild-sourced chips reported by Indonesia. Agarwood in Indonesia is treated as a non-timber forest product, with harvest and export quotas set at the provincial level. All trade in *Gyrinops* spp. since 2020 was reported to be derived from "decaying logs", with no trade in specimens originating from living trees. Quotas are established to control distribution of extraction and minimise disturbance to swamp. They are set for domestic and international trade in decaying logs and are based on the estimated potential yield from the total area of known swamps containing decaying logs (the Mappi and Asmat Regencies of South Papua province), but the exact methodology was not provided by Indonesia.

PROVISIONAL CATEGORY:	Given that Indonesia only exports derivatives from decaying logs of dead trees and not from living stands, the impact of trade on wild populations is likely to be non-detrimental. The case could therefore be categorised as **Less concern**, provided that Indonesia agrees to specify that export quotas for *Gyrinops* spp. relate to derivatives of decaying logs from the Mappi and Asmat Regencies, and agrees to publish an annual zero export quota for any other wild harvest. In addition, where possible, Indonesia could be requested to submit quotas that relate to the products exported (e.g. powder, chips). Clarification on the apparent quota excesses in 2021-2022 could also be requested.
PAPUA NEW GUINEA: Responded to the consultation relating to the RST	The number of *Gyrinops* species occurring in Papua New Guinea (hereafter PNG) is uncertain but includes at least two species (*G. caudata* and *G. ledermanii*). PNG confirmed that no information on the population size, status or trends of *Gyrinops* spp. in the country is available. However, *G. ledermanii* is thought to be the most widely distributed species in PNG, and is estimated to have undergone a 30% decline globally over the past three generations (90-150 years) as a result of commercial exploitation, driven by international demand for agarwood. PNG has submitted annual reports to CITES for all years 2013-2022 with the exception of 2021, and has not published CITES export quotas for this genus. Direct trade in *Gyrinops* spp. from PNG was largely composed of wild-sourced chips (21 545 kg as reported by Papua New Guinea) and timber (8781 kg reported by importers only). A management plan for natural agarwood resources was produced in 2011, which describes how the harvest of agarwood-producing trees should be conducted and regulated. However, PNG confirmed that no information was available on current harvest levels in the country, despite the existence of provisions relating to inventories and monitoring within the plan. Additionally, no information could be identified on the extent to which the harvest management practices and compliance monitoring procedures stipulated by the plan have been implemented.
PROVISIONAL CATEGORY:	Given the lack of recent information on the population status and harvest impacts on *Gyrinops* species in the country, as well as a lack of clarity regarding whether harvest management practices and compliance monitoring procedures are implemented, the basis for a robust non-detriment finding is not clear; therefore categorised as **Action is needed.**

B. RST background

PC26 marked the first time that *Gyrinops* spp. has been selected for inclusion in Stage 2 of the RST.

C. Species characteristics

Taxonomic note: There is no CITES Standard Reference for the genus *Gyrinops,* which contains nine accepted species according to Kew's Plants of the World Online (POWO, 2024). Molecular phylogenetic analyses have recently suggested that *Gyrinops* is paraphyletic to *Aquilaria*, with *Aquilaria* species nested within *Gyrinops* (Lee *et al.*, 2022). The taxonomy of the two genera is currently unresolved, with some authors highlighting the need for the phylogenetic relationships to be reassessed (Thompson *et al.*, 2022).

Gyrinops species have historically been distinguished from species included within the closely related *Aquilaria* genus by a single morphological characteristic, the ratio of the number of stamens to petals (Zich & Compton, 2001). However, some authors have suggested that other characteristics may be relevant to the genus-level assignment of these species (Lee *et al.*, 2018).

Biology: Species in the genus *Gyrinops* are evergreen, sub-canopy trees, that are found in primary and secondary forest (Ashton *et al.*, 2014; Sitepu *et al.*, 2011); *G. caudata* and *G. salicifolia* were reported to occur in swamps within these habitats (Jimbo & Mandawali, 2022; Mandawali & Barstow, 2022), but this may not be an exhaustive list of the *Gyrinops* species that are found in wetlands.

Gyrinops species typically range from 10-20 m in height and 10-35 cm in diameter (Jimbo & Mandawali, 2022; Mandawali & Barstow, 2022; Rindyastuti *et al.*, 2019; Zich & Compton, 2001). The altitudinal range occupied by *Gyrinops* varies between species; some, including *G. caudata* and *G. salicifolia*, usually occur at lower elevations (i.e. 5-20 m, although Auri *et al.*, 2021 reported that *G. caudata* can be found at altitudes up to 400m), whereas species such as *G. ledermanii* and *G. versteegii* occur at altitudes up to 1000 m and 1200 m respectively (BGCI *in litt.* to UNEP-WCMC, 2024; Jimbo & Mandawali, 2022; Mandawali & Barstow, 2022; Oldfield, 2022; Zich & Compton, 2001). No information could be located on the growth rate or reproductive patterns of *Gyrinops* species, although there is some indication in the literature that *G. versteegii* is considered to be slow-growing (Sutomo *et al.*, 2021). Seedling regeneration of *G. versteegii* was reported to be abundant in some areas of natural habitat on Flores Island (East Nusa Tenggara, Indonesia) (Fiqa *et al.*, 2020); this species is reportedly able to grow under a range of canopy conditions (Yulistyarini *et al.*, 2020). No information on the regeneration capacity of other *Gyrinops* spp. was located.

Gyrinops trees reportedly occur at low densities in their natural habitat (2 trees/ha) (Thompson *et al.*, 2022), although *G. ledermanii* individuals tend to be clustered, with locally high densities of trees (Oldfield, 2022).

Distribution: *Gyrinops* species are found in south and southeast Asia, including in Sri Lanka, southern India, Thailand, Cambodia, Lao PDR, Indonesia and Papua New Guinea (hereafter PNG) (Oldfield & Ediriweera, 2022; Thompson *et al.*, 2022). Seven *Gyrinops* species have been recorded in Indonesia: *G. caudata, G. decipiens*, *G. ledermanii, G. moluccana*, *G. podocarpus*[29], *G. salicifolia,* and *G. versteegii*. The number of species occurring in PNG is uncertain, but includes at least *G. caudata* and *G. ledermanii* (Jimbo & Mandawali, 2022; Lee *et al.*, 2018; Oldfield, 2022; Thompson *et al.*, 2022). *G. walla* is found exclusively in Sri Lanka (Oldfield & Ediriweera, 2022), and *G. vidalii* occurs in Thailand and Lao PDR (Oldfield, 2022); these species are not considered further in this review.

Population status and trends: Three of the species occurring in Indonesia and PNG have been assessed for the IUCN Red List: *G. ledermanii, G. salicifolia,* and *G. caudata. G. ledermanii* and *G. salicifolia* were categorised as Endangered in assessments conducted in 2020 and 2021 respectively (Mandawali & Barstow, 2022; Oldfield, 2022). The category was assigned on the basis of harvest pressure driven by international demand for agarwood, which was believed to have resulted in substantial population declines (Mandawali & Barstow, 2022; Oldfield, 2022). The assessment for *G. salicifolia* additionally refers to the species' "very restricted geographical range" (Mandawali & Barstow, 2022). *G. caudata* was categorised as Vulnerable in 2021 on the basis of the ongoing threat from overexploitation and a restricted geographical range (Jimbo & Mandawali, 2022).

[29] Also referred to as *G. podocarpa*.

All of the published IUCN Red List assessments for *Gyrinops* spp. note the limited availability of information on overall population sizes, but the three assessed species are believed to be decreasing in abundance globally (Jimbo & Mandawali, 2022; Mandawali & Barstow, 2022; Oldfield, 2022). The only quantitative estimate of decline available is for *G. ledermanii,* which is suspected to have undergone a population decline of 30% over the past three generations (90-150 years) (Oldfield, 2022).

IUCN Red List assessments for the remaining four *Gyrinops* species occurring in the two focal countries (*G. decipiens*, *G. moluccana*, *G. podocarpus* and *G. versteegii*) have not yet been formally accepted and published. However, all four of these species have been categorised as Endangered in provisional assessments (BGCI *in litt.* to UNEP-WCMC, 2024). The draft IUCN Red List assessment for *G. versteegii* cited a significant population decline, the existence of a small wild population of less than 2500 mature individuals, and the continued threat to the species in the wild from international trade as part of the rationale for the categorisation of the species (BGCI *in litt.* to UNEP-WCMC, 2024).

Threats: *Gyrinops* species are highly valued for producing agarwood (variously known as eaglewood or gaharu), a non-timber forest product derived from the resinous heartwood of the tree, and renowned for its aromatic and medicinal properties. Overharvesting, driven by global demand for agarwood, has been identified as the main threat facing all of the *Gyrinops* species assessed by the IUCN; these assessments note that agarwood-producing trees are indiscriminately felled across their range, regardless of whether individual trees are actively producing the prized resin (Jimbo & Mandawali, 2022; Mandawali, 2022; Mandawali & Barstow, 2022). Information on key destination markets and prices for agarwood can be found in the *Threats* section in the review for *Aquilaria malaccensis*.

Overview of trade and management: The genus *Gyrinops* was first included in CITES Appendix II on 12 January 2005 with annotation CoP13 #1; the listing currently carries annotation CoP19 #14[30].

According to the CITES Trade Database, global direct trade in *Gyrinops* spp. 2013-2022 was reported at the genus level and for four species (*G. caudata, G. ledermanii, G. versteegii*, and *G. walla*), of which three occur in Indonesia and/or PNG (all except *G. walla*). Direct exports reported for these three species and at the genus level over this period predominantly consisted of high volumes of wild-sourced chips and powder traded for commercial purposes, amounting to 355 691 kg of chips according to exporters (359 092 kg according to importers), and 888 731 kg of powder according to exporters (472 691 kg according to importers). Other commodities reported in direct trade included lower volumes of timber, roots, logs, wood products, and derivatives. While the majority of trade was reported at the genus level, the species with the highest level of reported trade was *G. versteegii*; exports of this species predominantly consisted of 132 618 kg of wild-sourced chips traded for commercial purposes according to exporters (120 961 kg according to importers). Overall, global direct trade in *Gyrinops* spp. has increased over the 10-year period and peaked in 2022, with the majority of trade reported between 2020-2022.

[30] All parts and derivatives except: a) seeds and pollen; b) seedling or tissue cultures obtained *in vitro* transported in sterile containers; c) fruits; d) leaves; e) exhausted agarwood powder, including compressed powder in all shapes; and f) finished products packaged and ready for retail trade, this exemption does not apply to wood chips, beads, prayer beads and carvings.

D. Country reviews

Indonesia

Distribution: Seven of the nine *Gyrinops* species recognised by Kew's Plants of the World Online occur in Indonesia; the distribution of each species in the country is outlined below. The island of New Guinea appears to be a centre of diversity for the genus, with occurrence records of five of the seven species (Lee *et al*., 2018; Lee & Mohamed, 2016).

G. caudata: is endemic to the island of New Guinea and can be found in the Indonesian provinces of Southwest and West Papua, with occurrence records showing that the species is present in Sorong (Jimbo & Mandawali, 2022) and the Manokwari, Teluk Bintuni and Teluk Wondama districts (Auri *et al*., 2021).

G. decipiens: occurs only in Sulawesi (Lee *et al*., 2018).

G. ledermanii: has reportedly only been recorded once in Indonesia, with a single record from the Vogelkop peninsula (Southwest Papua) (Oldfield, 2022).

G. moluccana: is found only in the Moluccas (Lee *et al*., 2018).

G. salicifolia: is restricted to the province of West Papua only, with an estimated extent of occurrence (EOO) in Indonesia of 27 770 km^2 and an area of occupancy (AOO) between 16 and 500 km^2 (Mandawali & Barstow, 2022).

G podocarpus: is found in West Papua (Lee *et al*., 2018).

G. versteegii: is found in the Lesser Sunda Islands (Lombok, Manggarai, Flores, Sumba, Sumbawa), Maluku Island, northeast Sulawesi (Minahasa) and the Indonesian province of Papua (Lorentz and Manokwari), with an EOO in Indonesia of at least 1 380 387 km^2 and an AOO of 60 km^2 (BGCI *in litt.* to UNEP-WCMC, 2024; Lee *et al*., 2018).

The CITES MA of Indonesia (*in litt*. to UNEP-WCMC, 2023) reported that the only exports of *Gyrinops* spp. from the country are of "decaying logs" (described as logs and roots with a diameter of approximately 50 cm that had been previously harvested and subsequently discarded in lowland swamp areas) from the Asmat and Mappi Regencies in South Papua province (Figure 7.1). According to the MA, these have not yet been identified to species. Based on an estimate produced in 2017, decaying logs from *Gyrinops* spp. were assumed to occur over an area of lowland freshwater swamp in the two Regencies that extends across 22 districts and covers ca. 815 000 ha (Figure 7.1) (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023).

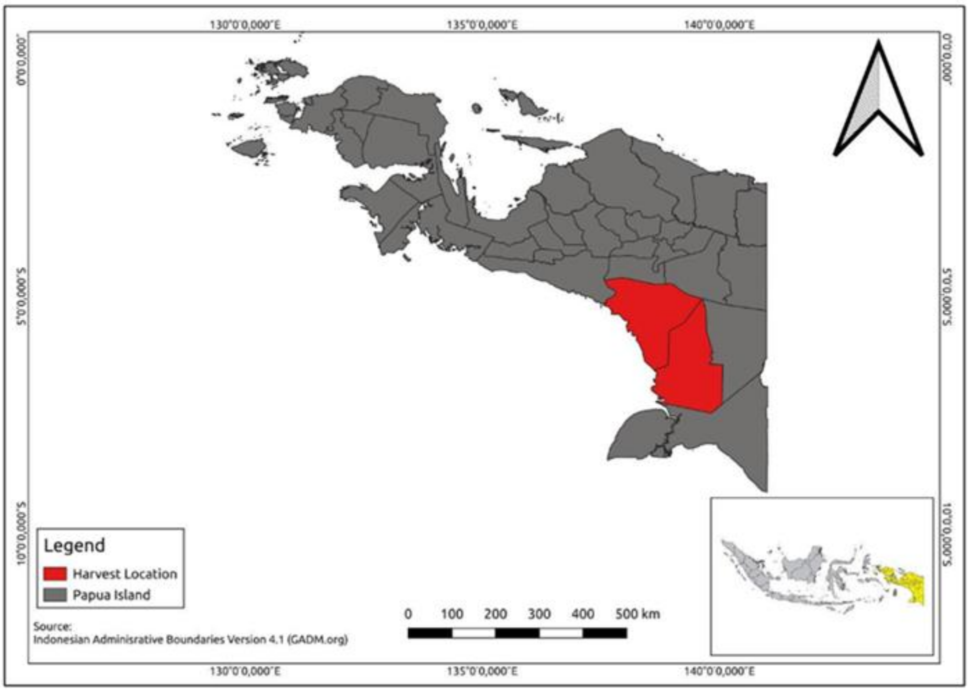

Figure 7.1: Distribution of decaying wood (*Gyrinops* spp.) in the Asmat and Mappi Regencies in South Papua. Source: CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023.

The boundaries and names shown, and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Population status and trends: No information on the country-specific population status or trends of six of the seven relevant species (*G. caudata*, *G. decipiens*, *G. ledermanii*, *G. moluccana*, *G. podocarpus* and *G. salicifolia*) that occur in Indonesia could be located, although three of these species, *G. caudata*, *G. ledermanii* and *G. salicifolia*, were considered by the IUCN Red List to be declining globally due to overexploitation (Jimbo & Mandawali, 2022; Mandawali, 2022; Mandawali & Barstow, 2022). As *G. salicifolia* is endemic to the Indonesian province of West Papua, it is assumed that its global conservation status is the same as its national status. In addition, the draft IUCN Red List assessments for *G. decipiens*, *G. moluccana* and *G. podocarpus* provisionally classified these species as globally Endangered (BGCI *in litt.* to UNEP-WCMC, 2024). These species are either endemic to Indonesia (*G. decipiens* and *G. moluccana*) or native to the island of New Guinea, so the IUCN Red List assessment status is similarly considered likely to be representative of the species' status in the country.

The provisional assessment for *G. versteegii* noted that this species is undergoing a continuing decline in mature individuals, although the magnitude of the decline in Indonesia is unknown (BGCI *in litt.* to UNEP-WCMC, 2024). Although there are many *G. versteegii* subpopulations are likely to persist across Indonesia, all subpopulations are considered to contain fewer than 250 mature individuals, with most studied sites containing fewer than 10 mature trees (BGCI *in litt.* to UNEP-WCMC, 2024). The global population was estimated to number fewer than 2500 mature individuals, following surveys conducted in in 2018 and 2019 by Sutomo *et al.* (2021) on the islands of Flores, Lombok and Sumbawa. The study concluded that finding the species outside of the three surveyed areas (two of which, on Lombok and Sumbawa, were protected) was unlikely due to the presence of more intense threats elsewhere (Sutomo *et al.*, 2021).

Another study conducted in 2018 in the Nggalak Protection Forest, Flores Island, where the collection of non-timber forest products is allowed, revealed a large population of *G. versteegii* seedlings, saplings, and immature trees (Fiqa *et al.*, 2020). Based on a sampling methodology that involved establishing transects in areas where *G. versteegii* trees had been identified, population densities of the species were estimated to be 313 individuals/ha for seedlings, 150 individuals/ha for saplings and

22 individuals/ha for immature trees (Table 7.1) (Fiqa *et al*., 2020). The study noted a lack of mature trees, assumed to be due to historic overexploitation (Fiqa *et al*., 2020).

Similar findings were obtained from surveys of primary and secondary natural forests in West Lombok (Lesser Sunda Islands), where *G. versteegii* is very rare: only seedlings and saplings could be found, while young coppice and small trees could only be found in mixed crop-plantations (Mulyaningsih *et al*., 2017). A lack of mature *G. versteegii* trees was also noted in natural forests at Mt. Timan (Timor Island) (Sujatmoko *et al*., 2011 in Fiqa *et al*., 2020), although some mature trees were reported to persist in a remnant forest patch (managed as a community forest) in the Manggarai district of Flores Island (Rindyastuti *et al*., 2019) (Table 7.1). The draft IUCN Red List assessment for *G. versteegii* noted the lack of information on populations of this species in Sulawesi and Papua (BGCI *in litt.* to UNEP-WCMC, 2024).

Table 7.1: Results of *G. versteegii* surveys conducted in East Nusa Tenggara, Indonesia, as reported in Rindyastuti *et al.* (2019) and Fiqa *et al.* (2020). All observation plots measured 20 x 20 m (0.04 ha).

Reference	Location	No. of plots	Stage	Stage definition	Density (inds./ha)	Average diameter (cm)	Average height (m)
Rindyastuti *et al.* (2019)	Pongkor, Manggarai district (Flores Island)	n=12	Seedling	DBH<1.5cm	23	0.47	0.23
			Sapling	DBH 1.5-10cm	15	5.91	4.45
			Pole	DBH 10-20cm	4	10.79	6.15
			Tree	DBH >20cm	6	29.35	7.00
Fiqa *et al.* (2020)	Ngallak, Manggarai district (Flores Island)	n=32	Seedling	height<1.5m	313	1.06	1.75
			Sapling	diameter <7cm	150	3.98	3.06
			Immature	diameter 7-22 cm	22	8.69	8
			Mature	diameter > 23cm	0	-	-

Threats: No species-specific threat information for *Gyrinops* spp. in Indonesia could be identified, but it is suspected that pressure from the overexploitation of agarwood-producing trees has been the main threat affecting all *Gyrinops* species (BGCI *in litt.* to UNEP-WCMC, 2024; Jimbo & Mandawali, 2022; Mandawali, 2022; Mandawali & Barstow, 2022). Both infected trees (producing the valued resin) and non-infected trees were reported to have been targeted (Mandawali, 2022), with mature *G. versteegii* reportedly the focus of harvest (BGCI *in litt.* to UNEP-WCMC, 2024).

There is a large domestic and export market for *Gyrinops* spp. in Indonesia, which are processed and traded as logs, chips, powder and resin (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023, see *Trade* section). However, no significant threats to *Gyrinops* spp. were identified by the CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023), since harvest and trade in *Gyrinops* spp. since 2020 was reported to have originated from decaying logs with no known trade in specimens originating from living stands; it was also noted that extraction and excavation activities do not result in disturbance of the forest since logs are located within open areas of swamp. The area in the Asmat and Mappi Regencies where the decaying logs are extracted was reported to be an abandoned forest concession (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023), although the MA of Indonesia also stated that the area of swampland assumed to contain decaying logs covers approximately 815 000 ha across the two Regencies. The MA noted that harvesting of trees for agarwood had occurred in this area in the past, with wood considered to have low or no resin abandoned in the mud, but later considered valuable and excavated. Extraction of the sunken logs represents the main livelihood of people living in the Asmat Regency and an important source of income for people living in Mappi Regency (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023).

The provisional IUCN Red List assessment of *G. versteegii* stated that there is still likely to be illegal trade involving this species in Indonesia (BGCI *in litt.* to UNEP-WCMC, 2024). Land use change for agricultural use, forest fires, coal mining and settlement development were, to a lesser extent, reported as threats relevant to the genus in Indonesia (BGCI *in litt.* to UNEP-WCMC, 2024; Jimbo & Mandawali, 2022; Turjaman, 2022).

Trade: Indonesia has submitted CITES annual reports for all years 2013-2022. According to the CITES website, Indonesia published a genus-level quota for *Gyrinops* 2013-2016 and 2021-2023 (Table 7.2); it additionally published species-level quotas for *G. versteegii* 2017-2023 (Table 7.3) and for *G. decipiens* in 2020 only (for 75 000 kg of 'decaying logs'). The quota for *G. decipiens* appears to have been erroneous; *G. decipiens* is endemic to Sulawesi and does not occur in the Asmat and Mappi Regencies. The CITES MA of Indonesia (*in litt*. to UNEP-WCMC, 2023) noted the nomenclatural discrepancies in recent published quotas, which were due to differing interpretations by officers dealing with new regulations, and stated that all names refer to the "same specimen, the decaying log from Asmat and Mappi". As noted above, the CITES MA of Indonesia (*in litt*. to UNEP-WCMC, 2023) also stated that all specimens traded under the genus *Gyrinops* since 2020 originated from decaying logs with no known trade in specimens originating from living stands.

Indonesia's quota book for 2023 lists *Gyrinops* spp. "agarwood (decaying log)", with Papua shown as the area receiving the entire 750 000 kg "harvesting quota": 650 000 kg of this quota was allocated for "domestic" consumption, whilst 100 000 kg was allocated as "overseas" export quota[31] (Decree N. 1/KSDAE/KKHSG/KSA.2/1/2023, 2023); the latter is consistent with the quota submitted to CITES. The information box accompanying the quota book states for *Gyrinops* spp. that "the resource comes from Mappi and Asmat with the type *Aquilaria filaria*, *G. versteegii* and *G. decipiens*"; the meaning of this note is unclear.

Direct exports as reported by Indonesia and importers appeared to exceed the wild-sourced genus-level quotas published on the CITES website for *Gyrinops* spp. in 2021 and 2022 when considering all trade terms reported by weight (Table 7.2); it is important to note that the genus-level quotas published by Indonesia did not specify a particular trade term. Additional remarks included in Indonesia's annual reports 2021-2022 noted that 292 759 kg in 2021 and 415 992 kg in 2022 were "waste from agarwood oil processing" with "no quota allocated"; if this trade is excluded from consideration of trade for annual export quotas, the quota for 2021 does not appear to have been exceeded, and the 2022 quota excess is reduced to 9820 kg.

Additionally, direct exports of *G. versteegii* appeared to have exceeded the species-level quotas in 2020-2021 as reported by Indonesia and 2020-2022 as reported by importers, when considering all trade terms reported by weight (Table 7.3). There was no direct trade in *G. decipiens* reported 2013-2022 (which was likely to have been an erroneous quota, as noted above).

Direct trade in all *Gyrinops* spp. from Indonesia 2013-2022 principally comprised 334 146 kg of wild-sourced chips and 887 061 kg of wild-sourced powder, with lower volumes of exports of wild-sourced logs and timber, as reported by Indonesia (324 479 kg of chips and 457 367 kg of powder reported by importers) (Table 7.4). Trade was almost entirely wild-sourced for commercial purposes, and the

[31] These terms were translated from Indonesian "Tangkap/Ambil", "Dalam Negeri" and "Luar Negeri".

majority was reported at the genus level. According to Indonesia, the major importers of chips and powder were Saudi Arabia and Taiwan Province of China, and the major importers of logs and timber were Taiwan Province of China and Viet Nam. The only trade reported at the species level over this period was for *G. versteegii*, predominantly traded as 132 618 kg of wild-sourced chips for commercial purposes according to Indonesia (120 961 kg reported by importers). Smaller quantities of *G. versteegii* logs, timber, derivatives, and wood products were also reported in direct trade (Table 7.4).

Indirect trade in *Gyrinops* spp. originating in Indonesia 2013-2022 principally comprised wild-sourced powder traded for commercial purposes, reported at the genus-level (115 504 kg according to re-exporters and 73 949 kg according to importers) (Table 7.5). Species-specific indirect trade originating in Indonesia comprised wild-sourced chips of *G. versteegii* for commercial purposes (8505 kg according to re-exporters and 7558 kg according to importers), and one shipment of 46 kg of wild-sourced *G. salicifolia* powder traded for commercial purposes (reported by the importer only).

Table 7.2: CITES export quotas published at the genus level for *Gyrinops* spp. from Indonesia 2013-2024, and direct exports of all wild-sourced *Gyrinops* spp. reported by weight (all trade terms) at the genus and species level as reported by Indonesia and importers, 2013-2022. Hyphens indicate years where quotas were not published or where trade data are not yet available. Apparent quota excesses are indicated by **bolded** quantities.

Wild	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Quota (kg)	5000 (agar wood)	5000 (agar wood)	5000 (agar wood)	5000 (agar wood)	-	-	-	-	100000*	175000	100000	-
Reported by exporter	5000	5000	5000	0	0	0	3825	232784	**391579**	**600809**	-	-
Reported by importer	4250	0	2500	0	0	0	3700	138011	**280882**	**367048**	-	-

* quota specified as being for "decaying logs" in information provided by the CITES MA of Indonesia (*in litt.* to the CITES Secretariat, 2023).

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 7.3: CITES export quotas published for *G. versteegii* from Indonesia 2013-2024, and direct exports of *G. versteegii* reported by weight (all trade terms), as reported by Indonesia and importers, 2013-2022. Hyphens indicate years where quotas were not published or where trade data are not yet available. Apparent quota excesses are indicated by **bolded** quantities.

Wild	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Quota (kg)	-	-	-	-	5000 (agarwood)	4500 (agarwood)	3825 (agarwood)	3251	3000	2700	-	-
Reported by exporter		5000	5000				3825	**76468**	**44125**	2700	-	-
Reported by importer			2500				3200	**52547**	**60039**	**6300**	-	-

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 7.4: Direct exports of *Gyrinops* spp. from Indonesia, 2013-2022.

Taxon	Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gyrinops spp.	chips	kg	P	I	Exporter											
					Importer						0.07					0.07
			T	W	Exporter	3000							300	54375	143853	201528
					Importer	4250						500	2150	59895	136723	203518
	logs	kg	T	W	Exporter	2000										2000
					Importer										10	10
	powder	kg	T	W	Exporter								156016	293079	437966	887061
					Importer								83314	160558	212495	456367
	roots	kg	T	W	Exporter										15280	15280
					Importer											
	stems	kg	T	W	Exporter										1010	1010
					Importer											
	timber	kg	T	W	Exporter											
					Importer										6500	6500
	wood products	kg	T	W	Exporter											
					Importer									500	5020	5520
		number of specimens	T	W	Exporter											
					Importer										500	500
Gyrinops versteegii	chips	kg	T	W	Exporter		5000	5000				3825	73718	42375	2700	132618
					Importer			2500				3200	50947	58514	5800	120961
	derivatives	kg	T	W	Exporter											
					Importer								600	1025		1625
	logs	kg	T	W	Exporter								1000	1750		2750
					Importer											
	powder	kg	T	W	Exporter											
					Importer								1000			1000
	timber	kg	T	W	Exporter								1750			1750
					Importer											
	wood products	kg	T	W	Exporter											
					Importer									500	500	1000

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 7.5: Indirect exports of *Gyrinops* spp. originating in Indonesia, 2013-2022. Quantities have been rounded to the nearest whole number, where applicable.

Taxon	Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gyrinops spp.	chips	kg	T	W	Exporter	149									188	337
					Importer									955		955
	oil	kg	T	O	Exporter	3										3
					Importer	3										3
	powder	kg	P	W	Exporter											
					Importer									6		6
			T	W	Exporter								29126	57537	28842	115504
					Importer								167	66399	7383	73949
Gyrinops salicifolia	powder	kg	T	W	Exporter											
					Importer									46		46
Gyrinops versteegii	chips	kg	T	W	Exporter								4500	4000	5	8505
					Importer								4488	3070		7558

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management:

Legislation: Several environment and forestry regulations coordinate the management of wild species in Indonesia, including:

- Government Regulation No. 7/1999 on preserving flora and fauna species, which classifies protected and unprotected species (*Gyrinops* spp. are not classified as protected species);

- Government Regulation No. 8/1999 on the exploitation and use of non-protected wild plants and animals; exploitation from the wild should be conducted in a controlled manner and whilst considering the species diversity and ecosystem balance; domestic, export or import trade of wild fauna and flora may only be conducted by business entities recommended by the Forestry Minister (Chapter V), and is subject to the establishment of annual harvesting quotas (Chapter XI);

- Government Regulation No.23/2021 regarding the implementation of forestry management, and Forestry Decree No. 447/Kpts-II/2003 on the harvest and distribution of specimens of wild plants and animals, which determines that the harvest of agarwood can take place from production forests and other land uses (where strict control of the quota system is in place) and must be carried out outside protected areas (Art 5).

Indonesia's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Quotas: Although the harvest of *Gyrinops* spp. since 2020 has been based on collection of decaying logs (the provenance of *Gyrinops* material traded by Indonesia 2013-2019 is unclear), Indonesia establishes an annual national quota to control the distribution of extraction and minimise disturbance to swamp ecosystems; this is set by the Management Authority based on recommendations made by the Scientific Authority (Government Regulation No. 8/1999; CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). It is assumed that this forms the basis for the non-detriment finding for exports.

Quotas for *Gyrinops* spp. were reported to be based on an "estimation of potential yield from the total area of known swamps that contain decaying logs in Mappi and Asmat", based on surveys carried out by Alhamd & Rahajoe (2018) and Alhamd *et. al.* (2019) (unpublished reports). The 2018 survey was reported to have recorded an estimated <120 000 tons of decaying logs in an area of 230 000 ha in the Mappi and Asmat Regencies; the estimated annual availability of these logs was 600-800 tonnes per year (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). As noted in the *Trade* section, Indonesia's quota book for 2023 allocated a total quota for decaying logs of *Gyrinops* spp. "agarwood (decaying log)" of 750 tonnes, with 650 tonnes allocated for domestic consumption and 100 tonnes allocated for export (Decree N. 1/KSDAE/KKHSG/KSA.2/1/2023).

The extraction of decaying logs is controlled via harvest permits; these are distributed to domestic permit holders, who may employ registered local operators to extract decaying logs from the mud, and then dry and sort extracted materials in registered facilities (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). The domestic and international movement of any material from the collection point to any other point must be accompanied by transport permits (stating the amount, unit, date and locations) issued by the authorities after inspection; any changes to the shipment, including any transformation the raw material might undergo, must be declared to the authorities (CITES MA of

Indonesia *in litt.* to UNEP-WCMC, 2023). The transport permits allow the authorities to monitor the usage of quotas in place (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023).

Plantations: Although technologies have recently been developed to distinguish wild- and plantation-sourced agarwood, access and the capacity to widely apply these technologies is recognised as a major regulatory challenge facing the trade globally (Thompson *et al.*, 2022). In Indonesia, Government Regulation No.23/2021 promotes the sustainable cultivation of non-timber forest products (such as agarwood), while the traceability of cultivated agarwood products is ensured by Certificates of Ownership of Agarwood Cultivation (Decree No. 447/Kpts-II/2003). The Forest Protection and Nature Conservation Regulation (No. P.25/IV-SET/2014) provides for a formal registration system for agarwood plantations and establishes that the harvesting of agarwood from registered plantations is not limited to an annual quota (CITES MA of Indonesia *in litt.* to UNEP-WCMC, 2023). The CITES MA of Indonesia (*in litt.* to UNEP-WCMC, 2023) reported that seedlings to be planted in operation areas are "obtained from the nearby standing stock"; however, cultivated agarwood is not commonly traded due to the long length of time between planting and harvest (Abdulah *et al.*, 2022) and is considered to be of lower quality than its wild-sourced equivalent (Thompson *et al.*, 2022).

G. versteegii is found in plantations in Java, Bali, Kalimantan, Nusa Tenggara, Gorontalo and Papua (Turjaman & Hidaya, 2017; Turjaman, 2022), with *G. caudata* planted in Papua only (Turjaman, 2022); however, no clear data on the extent of these plantations could be located. Compared to other Asian agarwood producing countries, Indonesian plantations are generally established at small-scale, traditionally managed by farmers, usually not recorded and sporadic in distribution (Turjaman & Hidayat, 2017). As an example, on the Island of Flores, where wild trees of *G. versteegii* are difficult to find, the species occurs in mixed-crop plantations (e.g. cacao, clove, coffee) without a clear planting pattern (Iryadi *et al.*, 2021).

Protected areas: Two sub-populations of *G. versteegii* were reported to occur in protected areas on the islands of Lombok and Sumbawa (Sutomo *et al.*, 2021); no information on the occurrence of other *Gyrinops* species in protected areas within Indonesia could be located.

Illegal trade: No seizures involving *Gyrinops* species from Indonesia were reported within the TRAFFIC Wildlife Trade Portal 2013–2022 (TRAFFIC International, 2024). The provisional IUCN Red List assessment for *G. versteegii* notes that there is “still likely to be” illegal trade in this species in Indonesia (BGCI *in litt.* to UNEP-WCMC, 2024).

Papua New Guinea

Distribution: The number of *Gyrinops* species occurring in PNG is uncertain. Five of the nine *Gyrinops* species (*G. caudata*, *G. ledermanii*, *G. podocarpus*, *G. salicifolia* and *G. versteegii*) are found on the island of New Guinea (Ding Hou, 1960 in Zich & Compton, 2001), which is divided along an east-west split into PNG and the Indonesian region of Papua. According to the information provided by the CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023), two *Gyrinops* species occur in the country: *G. caudata* and *G. ledermanii*. One source from the literature also suggested that *G. versteegii* is known from PNG (Gunn *et al.*, 2004), although no location-specific occurrence records could be identified. Further detail is given below:

> ***G. caudata:*** while GBIF occurrence records only show *G. caudata* as occurring in the Indonesian province of West Papua, recent observations have also been reported from the Central and Gulf provinces of PNG (Conn & Damas, 2024; Jimbo & Mandawali, 2022).

G. ledermanii: is endemic to the island of New Guinea and is considered to be the most widespread *Gyrinops* species in PNG (Oldfield, 2022). This species is known to occur in tropical rainforests below an altitude of 1000 m, in northeastern PNG: West Sepik (Sandaun) and parts of East Sepik and Madang provinces (specifically in the Bogia and Middle Ramu areas) (Oldfield, 2022). According to Gunn *et al.* (2004), suitable habitat for *G. ledermanii* is also predicted to occur more widely in the southern and western provinces of PNG.

G. versteegii: Gunn *et al.* (2004) noted that the species is known from PNG, although no further information on the distribution of this species within the country could be identified.

G. podocarpus* and *G. salicifolia: No information could be located confirming the occurrence of these New Guinean *Gyrinops* species within PNG.

As well as the species-specific records outlined above, there are further records and anecdotal reports of agarwood-producing trees from several other provinces, including the Enga (reported as Wabag), Milne Bay, Northern / Oro, Southern Highlands and Western provinces (Gunn *et al.*, 2004). The CITES MA for PNG (*in litt.* to UNEP-WCMC, 2023) also noted that species in the *Gyrinops* genus are found in some high-altitude areas of Morobe province, although the distribution information provided was not species-specific.

Population status and trends: While a 2011 Management Plan for Natural Eaglewood Resources in PNG highlights the importance of conducting a national inventory of agarwood-producing trees (Papua New Guinea Forest Authority, 2011), the CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023) indicated that no information on the population size, status or trends for *Gyrinops* species was available. Five processes for conducting such inventories were envisaged in the 2011 Management Plan, but these do not appear to have been implemented.

The IUCN Red List assessment for *G. ledermanii* (the most widely distributed species in PNG) provides some information on assumed trends for this species. Whilst agarwood-producing species were still viewed as being "fairly widespread" in remote mountainous regions of PNG, the population of *G. ledermanii* is considered to have declined "relatively rapidly" due to commercial exploitation over the past 25 years (Oldfield, 2022). Some populations of this species are regarded as being at "extreme risk" (Oldfield, 2022). The magnitude of the decline in *G. ledermanii* is suspected to have been approximately 30% over the past three generations (90-150 years) and continued pressure from overexploitation was considered to have the potential to result in a 60% population decline over the next 100 years (Oldfield, 2022). No information specific to PNG could be located on the population status of the other *Gyrinops* species that occur on the island of New Guinea (*G. caudata*, *G. podocarpus*, *G. salicifolia* and *G. versteegii*).

Monitoring conducted in areas of PNG associated with agarwood-producing species during 2002 and 2003 revealed that densities of agarwood-producing trees ranged from 41 to 315 stems/ha (Gunn *et al.*, 2004). The regeneration of saplings was also reported from areas that had been harvested (Gunn *et al.*, 2004).

Threats: Although *G. ledermanii* is noted to be frequently targeted for its valuable resin (Oldfield, 2022), harvest impacts on *Gyrinops* spp. in PNG are described as being poorly understood at the species level (Jimbo & Mandawali, 2022; Oldfield, 2022). The CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023) confirmed that there is a domestic market for *Gyrinops* products, but no data were available on the volume of harvest for this market. The primary threat to the genus was considered by the MA to be illegal harvesting and mismanagement by harvesters due to a lack of information and knowledge.

Gyrinops species were not traditionally exploited in PNG, and harvesting is believed to have become prevalent in 1997 (Zich & Compton, 2001). Interviews conducted in East and West Sepik in 2001 revealed that harvesters often (but not always) used destructive techniques to ascertain whether a specimen contained the valuable resin (Zich & Compton, 2001), since only a small proportion (3-8%) of trees produce it (Gunn *et al.*, 2004). These techniques included chopping down or uprooting the entire tree (Zich & Compton, 2001). Although unexploited stands of agarwood-producing trees were noted to be in existence in 2001, harvest rates in sample plots in the Hunstein Range in East Sepik were estimated to range from 12 to 39% for *G. ledermanii* trees with a diameter at breast height of ≥5 cm (Zich & Compton, 2001). No information could be located to verify whether these harvest rates reflect the current situation in the country.

G. ledermanii is also threatened by the conversion of natural habitat for agriculture or other forms of development (Oldfield, 2022). The bark of *G. ledermanii* is reportedly used as fuel in areas surrounding Lake Murray in PNG's Western Province, although it is unknown whether this use constitutes a threat to the species (Oldfield, 2022).

Trade: PNG has submitted CITES annual reports for all years 2013-2022 with the exception of 2021, which had not yet been received at the time of writing. PNG has not published any CITES export quotas for this species.

Direct trade in *Gyrinops* spp. from PNG 2013-2022 principally comprised wild-sourced chips (21 545 kg according to PNG and 34 226 kg as reported by importers) and timber (8781 kg reported by importers only) traded for commercial purposes (Table 7.6). Eighty percent of chips reported by PNG were from *G. caudata* and *G. ledermanii*, whereas importers mostly reported chips at the genus level (81%). Singapore was the principal importer of chips and the only importer of timber.

Indirect trade in *Gyrinops* spp. originating in PNG principally comprised chips, powder, logs, and timber, mostly wild-sourced for commercial purposes and reported at the genus level (Table 7.7). Species-specific trade comprised wild-sourced chips of *G. caudata* (6500 kg reported by re-exporters and 4700 kg reported by importers) and 1.15 kg of wild-sourced *G. ledermanii* oil (reported by the re-exporter only) traded for commercial purposes.

Table 7.6: Direct exports of *Gyrinops* spp. from PNG, 2013-2022. Quantities have been rounded to the nearest whole number, where applicable. Hyphens indicate years where exporter CITES annual reports have not yet been received.

Taxon	Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gyrinops spp.	chips	kg	T	A	Exporter	4031								-		4031
					Importer											
				W	Exporter		4486							-		4486
					Importer		3095	6171	7414	6576	3696	835				27787
	logs	kg	T	W	Exporter									-		
					Importer				30							30
	timber	kg	T	W	Exporter									-		
					Importer		1351	1823	2728	653	943	368				7866
Gyrinops caudata	chips	kg	T	W	Exporter			19	9580	4225	804	1203		-		15831
					Importer	6439										6439
	timber	kg	T	W	Exporter									-		
					Importer	915										915
Gyrinops ledermanii	chips	kg	T	W	Exporter			636	592					-		1228
					Importer											

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Table 7.7: Indirect exports of *Gyrinops spp.* originating in PNG, 2013-2022. Quantities greater than one have been rounded to the nearest whole number, where applicable.

Taxon	Term	Unit	Purpose	Source	Reported by	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Gyrinops spp.	chips	kg	T	A	Exporter											
					Importer		1300									1300
				W	Exporter							2216		77	158	2450
					Importer	6500	400					1739		22	270	8931
	logs	kg	T	W	Exporter											
					Importer							1570			4010	5580
	oil	kg	T	A	Exporter					0.5						0.5
					Importer											
		l	T	W	Exporter							2				2
					Importer											
	powder	kg	T	W	Exporter											
					Importer		6379									6379
	timber	kg	T	W	Exporter							1900	689	1039	4562	8189
					Importer								386	1038		1424
Gyrinops caudata	chips	kg	T	W	Exporter	6500										6500
					Importer	4700										4700
Gyrinops ledermanii	oil	kg	T	W	Exporter									1		1
					Importer											

Source: CITES Trade Database 2024. Compiled by UNEP-WCMC for the CITES Secretariat. Available at: trade.cites.org. Accessed 11/04/2024.

Management: The CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023) confirmed that a Management Plan for Natural Eaglewood Resources was produced in 2011 for implementation by the PNG Forest Authority (PNGFA). Its aim was "to sustain and maintain viable populations of eaglewood in natural forest areas in PNG".

Legislation: Forest resources are renewable assets in PNG, and the legal framework governing their management is set out by the Forestry Act (1991) and the provisions of the National Forest Policy 1991.

Article 6 a) of the Forestry Act (1991) establishes the PNGFA as the agency responsible for overseeing the management, development and protection of PNG's forest resources, including the management of agarwood-producing trees as a minor forest product. Under section 107 of the Forestry Act (1991), all participants in the agarwood trade (including traders and exporters) are required to register as Forest Industry Participants (FIPs), who can only carry out forestry activities under: (a) a Forest Management Agreement (FMA, for 50 years and with the cutting cycle of 35 years), (b) a Timber Authority (TA, where annual timber harvesting does not exceed 5000 m^3 and the timber is for domestic processing only, or where harvesting occurs for purposes such as road line clearance, or to extract other forest products), or (c) a Forest Clearing Authority (FCA). Sect. 54 of the Forestry Act (1991) establishes that the development of forest resources should take place in accordance with National Forest plans. The CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023) confirmed that management practices affecting the planting and harvest of *Gyrinops* species vary between the areas where different licencing arrangements (i.e. FMAs, TAs, FCAs) apply, but no further information was located.

The harvest of agarwood-producing trees within protected forest areas (National Parks, Conservation Areas and Wildlife Management Areas) is subject to specific management rules relevant to each area (Papua New Guinea Forest Authority, 2011). According to the 2011 Management Plan, it is also a legal requirement for buyers and exporters of eaglewood to obtain licences to buy, sell, transport, harvest and export eaglewood products (Papua New Guinea Forest Authority, 2011).

PNG's national legislation is included in Category 1 in the CITES National Legislation Project (legislation that is believed generally to meet all four requirements for effective implementation of CITES).

Harvest management and compliance monitoring: PNG's 2011 Management Plan stipulates that natural stands of agarwood "must be harvested in a sustainable manner by the landowners for their long term benefit" (Papua New Guinea Forest Authority, 2011). Landowners are required to conduct an inventory of agarwood-producing trees within their resource area with a diameter at breast height >10 cm, using line transects or circular plot methods (Papua New Guinea Forest Authority, 2011). Landowners must also submit a "Harvesting Plan", containing an inventory and an evaluation of the agarwood resource, for approval by PNGFA before harvesting can take place (Papua New Guinea Forest Authority, 2011). PNG's Management Plan also contains specific instructions on agarwood harvesting methods, including guidance on selecting potential agarwood-producing trees (Papua New Guinea Forest Authority, 2011). Resource owners must undertake enrichment planting of agarwood-producing trees within stock areas (Papua New Guinea Forest Authority, 2011).

PNGFA has responsibility for monitoring agarwood harvesting within Timber Authority sites, Forest Management Areas, Local Forest Areas and Forest Clearing Authority projects (Papua New Guinea Forest Authority, 2011); outside of these areas monitoring is the responsibility of Local Eaglewood Committees (LECs) established within resource-owning communities (Papua New Guinea Forest

Authority, 2011). PNG's 2011 Management Plan states that monitoring should be undertaken to assess the stock of agarwood-producing trees, the harvesting methods used, the number of trees harvested, waste, the management of nurseries, enrichment planting practices and the maintenance of enrichment plantings (Papua New Guinea Forest Authority, 2011). Under the Plan, major instances of non-compliance with the requisite management practices within a given resource area (including harvesting wood from unmarked trees, a lack of enrichment planting and a ≥50% reduction in the standing stock of agarwood-producing trees) can ultimately result in a harvest suspension (Papua New Guinea Forest Authority, 2011).

It is unclear how comprehensively the 2011 Management Plan is being implemented. Given that the CITES MA of PNG (*in litt.* to UNEP-WCMC, 2023) stated that no inventory data were available for *Gyrinops* spp., this aspect at least appears not to reflect current practice. No information could similarly be identified on current levels of compliance with the harvest management standards established, or on extent to which compliance monitoring is actively being undertaken.

Plantations: Agarwood plantations were reportedly in the process of being established in PNG in the early 2000s (Gunn *et al.*, 2004), and *G. ledermanii* has reportedly been the focus of propagation and genetic improvement research by the PNG Forest Research Institute (Saulei *et al.*, 2012). However, according to the IUCN Red List assessment for *G. ledermanii*, the establishment of small-holder plantings in PNG was reported to be still "in its infancy" (Oldfield, 2022). Reliably distinguishing plantation-origin agarwood from wild-sourced products is considered to be a major challenge hampering the effective implementation of CITES controls (Thompson *et al.*, 2022).

Protected areas: No information on the occurrence of *Gyrinops* species in protected areas in PNG could be identified.

Illegal trade: No seizures involving *Gyrinops* species were reported within the TRAFFIC Wildlife Trade Portal 2013–2022 (TRAFFIC International, 2024), although in 2004, the illegal trade in agarwood in PNG was reportedly judged to be "much larger than the legal trade" (Gunn *et al.*, 2004).

E. Problems identified that are not related to the implementation of Article IV, paras 2(a), 3 or 6(a).

None identified.

F. References

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ORIENTACIÓN SOBRE LA FORMULACIÓN DE RECOMENDACIONES PARA EL EXAMEN DEL COMERCIO SIGNIFICATIVO

Introducción

En este documento se proporciona orientación general sobre la formulación de recomendaciones para el proceso de examen del comercio significativo. Se ofrece orientación para la estructura de las recomendaciones y una lista de recomendaciones normalizadas para que los Estados del área de distribución para que sean utilizadas por el Grupo de trabajo sobre el examen del comercio significativo que se establece en las reuniones de los Comités de Fauna y de Flora.

Las recomendaciones normalizadas se proporcionan para facilitar la labor del Grupo de trabajo sobre el examen del comercio significativo que se establece en las reuniones de los Comités de Fauna y de Flora y para garantizar la coherencia de las recomendaciones a lo largo del tiempo, entre los Comités y para diferentes especies y Estados del área de distribución.

La recomendación

La recomendación debería incluir una serie de componentes clave:

- la medida recomendada que se eligió para abordar los problemas de aplicación de los párrafos 2(a), 3 ó 6(a) del Artículo IV, identificados en el proceso de examen;

- el calendario para la aplicación de la medida recomendada con una fecha límite clara;

- según proceda, una recomendación final que permita al Estado del área de distribución elegido proporcionar retroalimentación sobre la manera en que las medidas recomendadas han mejorado la base para formular dictámenes de extracción no perjudicial y cómo se llevará a cabo cualquier supervisión a largo plazo en el futuro;

- una justificación por la elección de la medida recomendada con referencia al informe del consultor, según proceda; y

- una clara indicación de a quién va dirigida la recomendación (p.ej., Estado del área de distribución, Comité Permanente)

Recomendaciones sobre las medidas a adoptar para mejorar la base de la formulación de dictámenes de extracción no perjudicial

Las recomendaciones pueden incluir medidas a corto plazo que se estima que son relativamente fáciles de aplicar (por ejemplo, cupos provisionales o restricciones de tamaño para la exportación), o medidas a largo plazo que se reconoce que su aplicación es más compleja, requiere importantes recursos y exige mucho tiempo. La intención de las medidas a corto plazo es proporcionar medios relativamente rápidos para abordar cuestiones de preocupación inmediata; sin embargo, las medidas a largo plazo pueden promover el desarrollo de soluciones duraderas en pro de la aplicación del Artículo IV. En función de la situación, uno o ambos tipos puede ser apropiado. El punto final de los cupos provisionales de exportación u otras recomendaciones a corto plazo no debería normalmente sobrepasar la fecha de cumplimiento de las recomendaciones a largo plazo.

Todas las medidas recomendadas deberían convertirse en recomendaciones completas que incluyen todos los elementos clave descritos en la parte B de este Anexo, y deberían ajustarse a los principios básicos de ser limitadas en el tiempo, factibles, mensurables, proporcionales (con la índole y la severidad del riesgo), transparentes y promover el fomento de capacidad, según proceda.

En los Cuadros 1 - 4 figuran diferentes tipos de medidas recomendadas:

- en los Cuadros 1 y 2 se presentan las medidas recomendadas normalizadas a corto y largo plazo para los Estados del área de distribución, que pueden requerir perfeccionamiento para casos específicos (p.ej., combinación especie/país). Pueden darse casos en que las medidas alternativas recomendadas sean más apropiadas;

- en el Cuadro 3 se presenta una muestra de texto para una “medida recomendada final” que podría considerarse para su inclusión en una serie de recomendaciones para cada combinación especie/país; y

- en el Cuadro 4 se proporciona una muestra de texto para medidas recomendadas dirigidas al Comité Permanente para abordar los problemas identificados que no están relacionados con la aplicación de los párrafos 2(a), 3 ó 6(a) del Artículo IV.

- En el Cuadro 5 se presenta una muestra de modelo para preparar recomendaciones que contienen todos los componentes clave.

Cuadro 1. Ejemplos de medidas recomendadas a corto plazo

Problema/ Preocupación	**Objetivo a corto plazo**	**Medidas recomendadas**
Los niveles de exportación son insostenibles y es preciso tomar medidas inmediatas antes de que puedan aplicarse medidas a largo plazo	Reducir los niveles de exportación	Establecer, en consulta con la Secretaría y la Presidencia del comité relevante, un cupo de exportación conservador provisional dentro del plazo de xx días para la especie/especímenes/productos y comunicar el cupo a la Secretaría. No deberían tener lugar exportaciones hasta que se publique el cupo en el sitio web de la Secretaría. El cupo de exportación (que puede incluir exportaciones admisibles nulas) debería justificarse como conservador, basándose en estimaciones de capturas sostenibles que hacen uso de la información científica disponible. Antes de permitir un aumento a este cupo provisional (inclusive un aumento a un cupo de exportación nulo) el Estado del área de distribución debe comunicar los cambios previstos a la Secretaría y a la Presidencia del comité relevante acompañado de una justificación de cómo el cambio es conservador, basándose en estimaciones de capturas sostenibles que hacen uso de la información científica disponible, para su aprobación.
Algunos aspectos de la explotación son objeto de preocupación inmediata	Reducir la explotación asociada con el aspecto motivo de preocupación para ayudar a garantizar que la exportación internacional no es perjudicial para la supervivencia de la especie	Iniciar medidas de explotación apropiadas para garantizar la sostenibilidad [*por ejemplo*]: - explotación de tamaños selectivos / - temporadas de caza y de veda / - temporadas de explotación/ - máximo de la explotación/ - restricciones a la frecuencia de la explotación, sitios o periodo del día/ - control del número de explotadores/ - tipos y métodos de explotación
Información inexacta/variable en los permisos que puede subsanarse inmediatamente	Normalizar la información en el permiso	Iniciar medidas para velar por que las descripciones en todos los permisos CITES están normalizadas de modo que la exportación solo se autoriza a nivel de especie y que cumple con los dispuesto en el Anexo 1 a la Resolución Conf. 12.3 (Rev. CoP16); el comercio deja de comunicarse o se autoriza a nivel de taxón superior. - Aclarar y normalizar los términos y las unidades utilizados para comunicar el comercio. Velar por que los términos y unidades apropiados se registran en los permisos para el comercio. Los términos normalizados y las unidades apropiadas figuran en la versión más reciente de las *Directrices para la preparación y presentación de informes anuales CITES, que se encuentran en la Resolución* Conf. 11.17 (Rev. CoP16), y fueron distribuidas por la Secretaría en una Notificación.

Problema/ Preocupación	Objetivo a corto plazo	Medidas recomendadas
		- Garantizar que en los permisos expedidos para las especies se indique de manera clara y precisa el origen de los especímenes

Cuadro 2. Medidas recomendadas propuestas a largo plazo

Las recomendaciones a largo plazo se organizan en torno a las cuatro principales esferas asociadas con la aplicación del Artículo IV, y podría ser necesario perfeccionarlas para caso específicos, para especies o para el Estado del área de distribución concernido.

		Medidas recomendadas proporcionales al riesgo percibido para las especies		
Problema/ Preocupación	**Meta**	**En función del riesgo creciente** →		
Falta de conocimiento del estado nacional de la población de la especie (tamaño de la población, tendencias, amenazas, distribución etc.)	Mejorar los conocimientos disponibles sobre la especie para formular dictámenes de extracción no perjudicial	- Realizar estudios basados en datos científicos sobre el estado de la especie (p.ej., tamaño/densidad de la población, tendencias, distribución) inclusive una evaluación de las amenazas para la especie para su utilización como base para formular dictámenes de extracción no perjudicial	- Desarrollar/aplicar un programa de supervisión continua de la población basado en datos científicos que se utiliza conjuntamente con un programa de gestión adaptable para la especie (véanse las medidas de gestión de la explotación y los controles del comercio, *infra*), para su uso al formular dictámenes de extracción no perjudicial	
Falta de medidas o medidas insuficientes de gestión de la explotación	Aplicar medidas de gestión de la explotación para mitigar los impactos de la exportación de la especie	- Emprender una supervisión cualitativa de la escala y las tendencias de toda la explotación (aumentando, estable o disminuyendo) para usarla en la formulación de dictámenes de extracción no perjudicial - Desarrollar y aplicar directrices para la explotación (o “las mejores prácticas”) que	- Desarrollar y aplicar la gestión local que defina claramente las medidas de gestión de la explotación (p.ej., temporadas de explotación, máximos de explotación, restricciones a la frecuencia de la explotación, sitios o periodo del día, control del número de explotadores, tipos y métodos de explotación)	- Desarrollar y aplicar planes coordinados de gestión nacionales y/o locales (que incluyan consideraciones sobre la gestión de las extracciones) con claros requisitos de supervisión; la gestión deberá ser adaptable (examen periódico de los registros de las extracciones y de sus efectos así como ajuste de las instrucciones con relación a las mismas, en caso de ser necesario); las restricciones de las extracciones se basarán en los resultados de la supervisión

		Medidas recomendadas proporcionales al riesgo percibido para las especies		
Problema/ Preocupación	**Meta**	**En función del riesgo creciente** →		
		describan las prácticas aceptadas		
Falta de controles o insuficientes controles de la exportación	Aplicar controles a la exportación para mitigar los impactos de la exportación sobre la especie	- Emprender una supervisión cualitativa de la escala y las tendencias de toda la explotación (aumentando, estable o disminuyendo) para usarla en la formulación de dictámenes de extracción no perjudicial - Tomar medidas para garantizar que la información que figura en los permisos esté normalizada (por ejemplo, exportación sólo a nivel de especie, indicación del origen de los especímenes, constancia de los factores de conversión, unidades normalizadas)	- Emprender la supervisión de la exportación; cualquier límite establecido a la exportación es cautelar	Emprender reconocimientos cuantitativos periódicos de la escala y la tendencia de todas las exportaciones; establecer/modificar los límites de las exportaciones con arreglo a los datos cuantitativos que se examinan regularmente, por ejemplo, mediante un programa de gestión adaptable para la especie
		- Aplicar/mejorar un sistema para garantizar que los ejemplares en los sistemas de producción en cautividad, en granjas o reproducidos artificialmente se diferencias de los silvestres y tanto los especímenes silvestres como los no silvestres son objeto de comercio		

		Medidas recomendadas proporcionales al riesgo percibido para las especies
Problema/ Preocupación	**Meta**	**En función del riesgo creciente** →
Capacidad inadecuada del Estado del área de distribución	Medidas para fomentar la capacidad del Estado del área de distribución	- designar claramente las autoridades CITES - impartir formación para las autoridades CITES (p.ej., Colegio Virtual CITES, talleres sobre los dictámenes de extracción no perjudicial en un país o región) - desarrollar métodos y materiales de identificación - compartir información/colaborar con otros Estados del área de distribución (intercambio de información sobre los dictámenes de extracción no perjudicial, desarrollo y aplicación de medidas de gestión regional) - impartir formación sobre conservación al personal del Estado del área de distribución - proporcionar información y orientación a personas y organizaciones que participan en la producción y exportación de especímenes de la especie concernida - facilitar el intercambio de información entre los Estados del área de distribución -proporcionar equipo y apoyo técnico

Cuadro 3. Recomendación final

Muestra de texto para una "medida recomendada final" que podría considerarse para su inclusión en la serie de recomendaciones para cada combinación especie/país.

Medida recomendada final	Meta	Medidas recomendadas
	Ayudar en la evaluación sobre si se ha mejorado la base para formular dictámenes de extracción no perjudicial como resultado del proceso de Examen del comercio significativo	-Tras la finalización de otras recomendaciones, a más tardar el xx, el Estado del área de distribución debería proporcionar la base científica en la que se fundó para establecer que las exportaciones de su país no son perjudiciales para la supervivencia de la especie y cumplen con lo previsto en los párrafos 2(a), 3 y 6(a) del Artículo IV de la Convención. Debería prestarse particular atención a cómo las medidas que ha tomado o tomará el Estado del área de distribución responden a las preocupaciones/los problemas identificados en el proceso de Examen del Comercio Significativo.

Cuadro 4. Otras recomendaciones

Problema/ Preocupación	Meta	Medidas recomendadas
Problemas identificados que no están relacionados con la aplicación de los párrafos 2(a), 3 ó 6(a) del Artículo IV	Medidas que no están directamente relacionadas con la formulación de dictámenes de extracción no perjudicial	Recomendaciones dirigidas al Comité Permanente para que considere encargar al Estado del área de distribución que [por ejemplo]: -desarrolle y aplique medidas de control adecuadas y procedimientos de inspección para detectar e interceptar envíos ilegales de especímenes -promulgue legislación/reglamentación o mejore la existente -aplique rigurosamente prohibiciones a las exportaciones -garantice la orientación y controles adecuados para los establecimientos de cría en cautividad, en granjas o de reproducción artificial

Cuadro 5. Modelo para redactar recomendaciones

Complete cada cuadro para cada combinación especie/país. En la Parte A se proporciona un modelo para las recomendaciones dirigidas a los Estados del área de distribución, y en la Parte B para las recomendaciones que se someterán a la consideración del Comité Permanente

A. [*Insertar el nombre de la combinación especie/país*] informará a la Secretaría sobre la aplicación de lo siguiente:

Medidas recomendadas	**Plazo límite para la aplicación**	**Justificación de la elección de la medida recomendada**

B. El Comité Permanente considerará encargar a [*nombre del Estado del área de distribución*] lo siguiente:

Medidas recomendadas	**Plazo límite para la aplicación**	**Justificación de la elección de la medida recomendada**