



GOVERNMENT OF UGANDA

MINISTRY OF WATER AND ENVIRONMENT

FOREST SECTOR SUPPORT DEPARTMENT (FSSD)

NON-DETRIMENT FINDINGS REPORT ON OSYRIS LANCEOLATA FOR UGANDA

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1.0 INTRODUCTION

1.1 CONTEXT AND PROBLEM

Osyris lanceolata also known as African Sandalwood is one of the tree species which is threatened by trade in Uganda (CITES, 2013). The species is indigenous to East Africa and its popularity in the region is attributed to the high demand for Sandalwood oil which is extracted from the tree's fragrant scented wood (Uwimbabazi et al., 2021a). In Uganda, *O. lanceolata* thrives along the Kenya-Uganda boarder regions in Karamoja and Sebei sub regions (Uwimbabazi et al., 2021b). Aromatic oils extracted from the heartwood of *O. lanceolata* are among the main traded products from the species (CITES, 2013). In the past, extraction of oil from *O. lanceolata* (Sandalwood oil) was not widespread, with the decline in the major sources of Sandalwood oil from *Santalum album* in Australia and Asia (Gowda, Patil, & Ashwath, 2004), there was a shift to other Sandalwood species such as African Sandalwood. Consequently, harvesting and utilisation of *O. lanceolata* has increased in East African communities. The increase in utilization of the tree in East Africa is also partly due to the attractive prices of Sandalwood oil on the global market including ready markets in Asia and Europe which have occasioned an increase in trade of East African Sandalwood oil (CITES, 2013). Besides the oils extracted from *Osyris lanceolata*, the tree is a culturally and commercially important species in terms of provision of both local and industrial products: the fruits are edible in some communities; the roots give a strong red dye used to treat fibres for basketry; the hard-durable wood is used for timber, charcoal, and firewood; the root and bark have high medicinal benefits (CITES, 2013; Karuiki, 2018; Mwangi, Njoka, & Spaling, 2021).

In Uganda, the commercial trade of Sandalwood started around 2011 with the establishment of Sky Beam Africa Limited in Tororo district, ensuing the ban on harvesting and trade of Sandalwood in Kenya in 2007 (FSSD-MWE, 2021). Majorly, Sandalwood and its products were exported to Asian and European countries for the manufacture of pharmaceuticals, perfume, and cosmetics among others (FSSD-MWE, 2021). The export period was marked with unsustainable harvesting and unregulated trade in Sandalwood, and as a result, the population of *O. lanceolata* greatly decreased. A Daily Monitor report revealed that about 10 tonnes of trees were felled monthly for oil extraction that was largely exported to India (DailyMonitor, 2015). The report highlighted that harvesting was carried out on natural stands and unfortunately no tree planting efforts were put in place. Relatedly, no stock inventories of *O. lanceolata* trees were conducted

prior to allowance of Skybeam Africa Ltd (Uwimbabazi et al., 2021a). The trade in raw Sandalwood was banned in Uganda in 2016 following the listing of the species in Appendix II of the CITES and the irregularities associated with smuggling the raw sandalwood from neighbouring countries. Despite the ban, cases of illegal trade have been reported in the country (Uganda) (FSSD-MWE, 2021). Current consolidated data on *O. lanceolata* trees is lacking and undocumented. The absence of this information is a major impediment to assigning accurate conservation status and to assigning an annual allowable quota for trade (Mugula et al., 2021). Relatedly, in accordance with articles III and IV of the convention (CITES), export permits for specimens of species included in Appendices I and II shall only be granted when a scientific authority of a state has advised that such export will not be detrimental to the survival of the species (a determination well-known as a non-detrimental finding). On this basis, several studies have been conducted in the previous past regarding the; species' distribution, population information, management measures and harvesting systems, control and monitoring and conservation efforts, precautionary principle and in depth inventories conducted with the aim of gaining a broad understanding of the species status. The study reviews are intended to draw some lessons which could inform future management and conservation efforts of *O. lanceolata* in Uganda. This report addresses the following specific objectives:

- 1) Distribution status of *O. lanceolata* in Uganda
- 2) Population of *O. lanceolata* in Uganda
- 3) Management measures and harvesting systems of *O. lanceolata* in Uganda
- 4) Control and monitoring of *O. lanceolata* in Uganda
- 5) Conservation and precautionary principle

2.0 METHODOLOGY

Information for this report was collected from a combination of literature review of various databases. The search was carried out on different databases including Science Direct, Springer, Scopus, PubMed, Web of Science, Google Scholar, academic publications using key words such as “*Osyris lanceolata*”, “Sandalwood”, “African Sandalwood”, “Ecology of *Osyris lanceolata*”, “CITES listed tree species in Uganda”, “distribution of *O. lanceolata* in Uganda”, “conservation of *Osyris lanceolata*”, “management and utilization of *O. lanceolata* in Uganda”, and so forth.

Literature, from sources including the websites of IUCN, Newspapers and other national fora was also reviewed. From these reviews, information about *O. lanceolata* in Uganda was noted.

2.1 BACKGROUND INFORMATION ON NON DETRIMENT FINDINGS (NDF)

Provisions of the convention require member states to draft an NDF. Specifically, Article III of the Convention states that the import of specimens of Appendix 1-species requires import permits that shall only be granted when a scientific Authority of the state of import has advised that the import will be for purposes, which are not detrimental to the survival of the species involved, i.e. makes a NDF report. Article IV furthermore requires that a scientific authority monitors exports of specimens of Appendix-II species and, whenever necessary, advise the Management Authority of suitable measures to be taken to limit such exports in order to maintain such species throughout their range at a level consistent with their role in the ecosystems and well above the level at which they would qualify for Appendix 1. Furthermore, in Resolution Conf. 14.7 (Rev. CoP15) on Management of nationally established export quotas, the Conference of the Parties recommends that, when Parties establish national voluntary export quotas, they do so on the basis of a non-detriment finding made by their Scientific Authority; to ensure compliance, it was crucial to make a NDF report.

There is no clear, single, hard-and-fast guideline for making NDF. A manual containing a flexible methodological framework has been proposed to be adopted during the meeting of the Parties, from which the Parties might find the best option to use. We report here one of the three main schemes developed for making NDFs, including the Cancùn/Mexico expert workshop, the Resolution Conf. 16.7, and the BFN guidance. For this report, we adopted the Cancùn/Mexico expert proposed guidelines that were proposed during a workshop held in 2008 with five elements including: (1) Distribution area, (2) population information, (3) management measures and harvesting systems, (4) contrôle and monitoring, and (5) conservation and precautionary principle.

3.0 RESULTS

3.1 TAXONOMY

TABLE 1: TAXONOMY OF *O. LANCEOLATA*

Kingdom	Plantae
Class	Angiosperms
Order	Santalales
Family	Santalaceae
Genus	Osyris

O. lanceolata has a long list of synonyms suggestive of the taxonomic difficulty in its delineation. Synonyms of *Osyris lanceolata*, including author and year (CITES, 2013) are listed below

- *Osyris quadripartita* Decne (1836)
- *O. wightiana* J. Graham (1839)
- *O. abyssinica* Hochst. ex A. Rich (1850)
- *O. arborea* A. DC. (1857)
- *O. pendula* Balf.f. (1884)
- *O. rigidissima* Engl. (1895)
- *O. tenuifolia* Engl. (1895)
- *O. parvifolia* Baker (1910)
- *O. urundiensis* De Wild. (1925)
- *O. oblanceolata* Peter (1932)
- *O. densifolia* Peter (1932)
- *O. laeta* Peter (1932)
- *O. compressa* sensu auct., non (Berg.) (1954)

3.2 SPECIES CHARACTERISTICS

3.2.1 COMMON NAMES

East African Sandalwood

3.2.2 LOCAL NAMES

The local names of Sandalwood in Uganda include “*Ethinikook*”, “*Lomanang*”, and “*Munya chematyo*”.

3.2.3 DISTRIBUTION

The recent stand inventory of the species conducted by FSSD-MWE acknowledged five districts namely; Bukwo, Nakapiripirit, Amudat, Moroto and Kaabong where *O. lanceolata* naturally grows (Dopeth Project, 2015 & MWE stock inventory report 2021). The species has also been documented in Kigezi region and suspected to be present along the cattle corridor of Nakasongola-Kiruhura (Uwimbabazi et al., 2021b). The report by FSSD-MWE showed varying distribution in plant size class and space. The variation incited a strategy to classify the distribution areas into two categories: “Category A”; the areas where the species is at high risk or the habitat is in a high risk of being degraded through land use changes. These areas are found along the border lines with Kenya where illegal exploitation and trade is widespread. Whereas “Category B”; embodies areas where the species is at low risk or the habitat is in a low risk of being degraded through land use changes. Category B’ areas are located within protected areas like National parks, Wildlife reserves, Game reserves, Forest reserves, high mountainous places and far to reach inlands which do not make economic sense to harvesters to reap from.

3.2.4 HABITAT

O. lanceolata is often found in arid and semi-arid areas principally on stony or rocky areas and along margins of dry forests (Bekele et al., 2019; CITES, 2013; Kamondo et al., 2012; Mwang’ingo et al., 2003). It is frost and drought-tolerant (CITES, 2013), however, large trees can occur in humid climates, favourably in low soil pH and sufficient soil nitrogen (Gathara et al., 2014; Mwang’ingo et al., 2003). Sandalwood grows at an altitude of 900 to 2250m above sea level in areas with mean annual rainfall of 600 to 1600 mm (Burrows et al., 2018). In Uganda, most of the Sandalwood has been recorded in the wild and at higher elevations of about 1300-1760 metres above sea level.

The species is semi-parasitic, growing on the roots of other plants and exploiting the root systems of the hosts to get nutrients, but it does produce its own chlorophyll. The species can occur in isolation and in close association with other woody species which include; *Rhus natalensis*, *Euclea divinorum*, *Ozoroa insignia*, *Entada abyssinica*, *Acacia mellifera*, and *Carissa edulis*, and does not occur communally in large numbers. The species has been found in form of shrubs of a height range of 1-5 metres; and they are sparsely distributed within the area.

3.2.5 BIOLOGICAL AND MORPHOLOGICAL CHARACTERISTICS

The phenology of the East African Sandalwood is scantily studied. The phenology patterns of *O. lanceolata* and its growth behaviour in Uganda are not known. Currently, there is no information on abundance or population structure of this species in Uganda. Where it occurs, the population is restricted to a few individuals (~1 – 4). What is clear is that the population of the species has been reducing since the first assessment (Egging, 1966). *O. lanceolata* is a hemi-parasite implying that the species absorbs particular nutrients from the host trees via root connections called haustoria. *O. lanceolata* is mostly a large evergreen shrub but sporadically a small tree usually growing to a height of 1.2 to 9 metres and irregularly 14 m (CITES, 2013). The species is dioecious with a given tree being either male or female; It is multi-stemmed with dark-brown to blackish bark. The species has many drooping branches with bluish to yellow-green sharply pointed leaves (Kamondo *et al.*, 2014). Flowers are small, yellow-green, inconspicuously borne in an inflorescence that develops from the axil of leaves (Andiego *et al.*, 2019). The species leaves are alternate, lanceolata, 3-4.5 cm long, glaucous, thickly leathery, veining obscure; apex with a sharp tip; margin entire. Stamens are usually 3 and rarely 4. Fruits are round, about 1 cm in diameter, green when unripe, orange to red when ripe, and contain one whitish seed (Global Plants, 2020; Kamondo *et al.*, 2012; Mwang'Ingo *et al.*, 2007). Insects are not responsible for its pollination and frugivorous birds are involved in seed dispersal (Herrera, 1988, 1984). Previous inventories of the species in Uganda on *O. lanceolata* report that based on the phenotypic observations made, there could be two varieties of *Osyris lanceolata* species in Uganda. Leaf form varieties have been noted, with one of them having rounded leaves while the other has pointed leaves.

3.2.6 ROLE OF THE SPECIES IN THE ECOSYSTEM

The ecological functions of the species in the ecosystem have not well been understood as few studies have been done focusing on the species, however as in any ecological processes in the ecosystem, *O. lanceolata* provides services such as shade, prevent soil erosion; its trunks and branches support diversity of epiphytic plants (CITES, 2013). It also further offers mechanical support to vines; offers habitat for birds, mammals, reptiles, insects, and arthropods. The flowers provide nectar to insects. Some terrestrial invertebrates and birds feed on the flowers, seeds and fruits.

3.3 HARVESTING SYSTEMS AND PROCESSING OF *O. LANCEOLATA* IN UGANDA

3.3.1 HARVESTING OF *O. LANCEOLATA* IN UGANDA

Currently, harvesting of sandalwood in Uganda is done by the communities for various purposes. Depending on the purpose, any part of the species can be harvested. The people that majorly harvest Sandalwood in Uganda include the herbalists, charcoal burners/makers, and local people for building and firewood needs. Harvesting is mostly from wild populations, i.e., bush lands and communal grazing areas.

Previous inventories have revealed that herbalists can harvest enough Sandalwood that can be used for a period of 2 months; charcoal burners/makers harvest tree species for burning charcoal from the bush every week, but their target is not always Sandalwood due to its scarcity and size. They use the Sandalwood mainly to ignite other tree species in the process of burning charcoal because it burns longer and maintains the fire. Earlier surveys have noted that local people hardly fell the whole tree of *O. lanceolata* trees. The trees are mostly harvested for domestic uses or even for charcoal burning or fuelwood for selling. Even when they need the root for medicinal purposes, the local people do root pruning. They do not fell the whole tree.

Harvesting for trade in essential oils has been done by Sky beam Africa Ltd and Uganda Wood Impex Limited (UWIL). Uganda Wood Impex Limited (UWIL) majorly sources its Sandalwood from the Democratic Republic of Congo (DRC). Previous studies have revealed that the company uses about 20 to 30 tons of Sandalwood every month, which translates into 240-360 tons of Sandalwood per year (FSSD-MWE, 2021). UWIL purchases each kilogramme of Sandalwood from the source mostly in DRC at UGX. 300 and it incurs the transportation cost. The company incurs about US\$50,000 to buy and transport 30 tons of Sandalwood from DRC to the company base in Kalungu, whereas the amount of Sandalwood sourced/harvested by Sky Beam Africa Limited (SBAL) was reported as unknown by previous surveys as the company could not declare information to Natural resource officers (FSSD-MWE, 2021). It was also reported that Sky Beam Africa Limited did not support any regeneration activities of Sandalwood in Karamoja as initially agreed with NEMA in the EIA report as well as the MOU with Moroto District Local Government. The nursery structure was set up in Tapac at Tapac Sub County headquarters but no seedlings were ever raised from there.

3.3.2. PROCESSING OF O. LANCEOLATA IN UGANDA

The processing of sandalwood has been reported by earlier studies to be driven by specific purposes/uses and these vary locally and commercially.

3.3.2.1 LOCAL PROCESSING OF SANDALWOOD

The part of sandalwood to be used depends on the purpose such as the ailment to be treated.

- For herbal purposes, the leaves, bark and roots of sandalwood are mixed with other local tree species such as aloe vera and boiled. The boiled liquid is cooled at room temperature and then administered to the patient later on.
- For usage as beverage, the bark of sandalwood is preferred and this is debarked from the species, dried, pounded into ash, and then mixed with hot water for drinking.
- For tenderizing use, the pounded ash is mixed with cold water and sieved; the resultant liquid is kept for application in the sauce.

3.3.2.2 COMMERCIAL PROCESSING OF SANDALWOOD

Sandalwood is debarked and cleaned to remove its bark, nodes, and the soil. The debarked Sandalwood is cut into small pieces and crushed into powder/ash using machines. The powdered Sandalwood is packed tightly in metallic containers/cylinders and sealed firmly. The containers are subjected to very high temperature using firewood. The heating process continues for about 1 day an equivalent of 24 hours. The steam generated from the heated powder is captured using pipes and cooled to form a liquid product known as Sandalwood oil. The oil is collected, filtered and packed ready for export.

The major product at Uganda Wood Impex Limited, UWIL is Sandalwood oil and they produce about 100-200kg of Sandalwood oil per month. 5kg of Sandalwood produce 1kg of Sandalwood oil; however, this depends on the quality of the wood. Other products of Sandalwood produced by UWIL include;

- Sandalwood sap which costs US\$4 per kg
- Sandalwood chips which cost US\$35 per kg
- Heart wood which cost US\$15 per kg
- Sandalwood powder which cost US\$30 per kg

The major waste product generated after processing Sandalwood is dump woody materials and Sandalwood powder. UWIL dries and packs the generated powder in a container for export as Sandalwood powder. Sandalwood oil and other Sandalwood products are normally exported to India, France, United Kingdom, United States of America, Germany, South Africa, United Arab Emirates, among others.

3.4 UTILIZATION AND TRADE

3.4.1 UTILIZATION

To the local people in Uganda, *O. lanceolata* is used for fuelwood; charcoal; fencing and construction poles; leaves, roots and stem bark have medicinal value for treating stomachache, backache, joint pains, infertility in men and typhoid; and the stem is used to make beautiful walking sticks due to the brown-reddish stem by Karamajongs. Cultural uses of the species have been documented in some East African countries including Kenya (Mwangi et al., 2021), however Knowledge on cultural values, taboos and beliefs related to East African Sandalwood in Uganda have not been documented. Commercially the species is used in the manufacture of sandalwood chips, powder, Sandalwood oil and these are mostly exported.

3.4.2 TRADE OF OSYRIS LANCEOLATA IN UGANDA

3.4.2.1 LEGAL TRADE

The commercial trade of Sandalwood in Uganda began around 2011 following the ban on the harvesting and trade of Sandalwood in Kenya in 2007. Most of the traders during this period came from the East African coast and they engaged with the local communities in the Karamoja and Elgon regions to trade in Sandalwood. The climax period of the trade and larger scale harvesting of Sandalwood in Uganda was between 2011 and 2015. The trade was reportedly high, uncoordinated, unregulated and it led to overexploitation and eventually decline of the species in the area. The harvested Sandalwood would be exported to Kenya where it was processed and exported to destination countries of India, Germany, France, and USA among others. Some of the Sandalwood was also exported to Zanzibar where it was used in the manufacture of a perfume called “*Gift of Zanzibar*”. Previous studies of the species in Uganda report that 1 ton which an estimate of 1 TATA lorry of freshly harvested Sandalwood from the wild costs between UGX

700,000 and UGX 1 million (FSSD-MWE, 2021). After transporting the same quantity of Sandalwood to a landing site, the product fetches about UGX 5 million. Due to the high demand, heavy profits, and over exploitation of Sandalwood in Uganda, the species had greatly reduced by 2013 and the harvesting and trade in Sandalwood from Uganda was later banned in 2016 following the listing of the species in Appendix II of the CITES.

Two (2) companies are known to be/have been legally registered to trade in Sandalwood from Uganda i.e., Sky Beam Africa Limited (SBAL) and Uganda Wood Impex Limited (UWIL). SBAL closed its operations in Uganda in 2019 while UWIL is still operating its businesses from Uganda in Kalungu district. Sky Beam Africa Limited (SBAL) was established in Tororo district around 2008. The major purpose of its establishment was to produce Sandalwood oil for export. The company was to source Sandalwood from the Karamoja region in Uganda, specifically Tapac Sub county in Moroto District and it was required to revegetate the species through supporting activities such as raising Sandalwood nursery beds and supporting general tree planting activities to reduce community dependence of Sandalwood for firewood (FSSD-MWE, 2021). Through regular visits and audits, it was reported that the District Natural Resources office and NEMA found out that SBAL was instead relying on illegally harvested Sandalwood from Karamoja region as well as importing it from DRC, South Sudan, Kenya, Tanzania and New Caledonia through porous border points. Based on this, NEMA did not renew their working license in 2018. The company was given an ultimatum of six (6) months to finish their Ugandan sourced stocks, so the company closed off its operations in 2019. However, they were also given the option to continue operating the factory exclusively based on imported raw materials.

Uganda Wood Impex Limited (UWIL) was licensed by the CITES Management Authority in 2015 to trade in Sandalwood after securing a Uganda Free Zones investment license. The company is located in Kalungu district and also has offices in Kampala. The company is permitted to import Sandalwood from South Sudan and Democratic Republic of Congo. The company deals in Sandalwood chips, Heart wood, powder, wood and Sandalwood oil for export.

3.4.2.2 ILLEGAL TRADE OF SANDALWOOD IN UGANDA

Despite the government ban on the trade of Sandalwood in Uganda, cases of illegal trafficking and trade of Sandalwood in Uganda have been reported evidenced by the recent seizures and confiscation by the law enforcement agencies.

- In 2019, a truck carrying about 700kg of Sandalwood was impounded in Sironko district. The suspects were found with a Sandalwood movement permit indicating that the species was being transported to Masaka for laboratory testing activities. The permit had been issued by the District Natural Resources Officer (DNRO) of Amudat district. The suspects were arrested by Sironko police and later released on police bond. However, the Sandalwood somehow disappeared from the impounded truck at a police station and it was alleged to have been replaced with other firewood species.
- In 2019, a car was impounded in Amudat district with about 500kg of Sandalwood transporting it to Kenya.
- In 2018, about 50 tons of Sandalwood were impounded at Malaba trade point. The wood was illegally imported from Kenya. This case was left to be handled by URA customs for further prosecution.
- In 2017, about 20 tons of Sandalwood were impounded in Tororo district. The wood was handed over to a team of people from National Forestry Authority (NFA). In the same year about 2 tons of Sandalwood were seized in Busitema and these were handed over to NFA.
- In 2016, a lorry carrying 1 ton of Sandalwood was arrested from Chesowel in Bukwo district. The driver refused to stop and the police officers were compelled to shot at the car tyres. The case was immediately handled by the state house of Uganda.

3.5 TRACEABILITY OF *O. LANCEOLATA*

The East African sandalwood have been illegally exploited, processed and exported since 1990's. With the establishment of some processing plants, local wild populations have been over exploited to feed such factories to meet the market demands. As such, there are great fears of materials and products illegally moving across some porous borders in search for lucrative market prices. Previously, Uganda lacked country specific information such as DNA or genetic data that can be used to trace the origin of Sandalwood wood products. This therefore posed a serious need for a strong system for *O. lanceolata* traceability to indicate origin of the products in order to bring the offenders to book at the source. More recently, technologies have been proposed for tracking *O. lanceolata* logs, wood and wood products from their points of origin in the forest to the factories where they are processed into oil, wood dust, curvings and other wood products and to the final exit boarder points within Uganda. Conventional labels have been recommended for Uganda.

The conventional labels' technology is made of paper or plastic on which barcode information has been imprinted (de la Rochfordière, 2002). The system is based on bar coded tree and wood tags which are scanned by hand held computers which contain a GPS locator so that information is linked to a geographical location with a high level of precision (+/-10m). Once information is recorded, it is automatically uploaded to a central computer database where it can be verified. When checks are done in transit control points, these can be correlated with the original record in order to detect anomalies. Such labels are more difficult to counterfeit than lower technology labels. These labels can be scanned electronically or read manually if necessary. They are typically affixed to logs or other products with staples, and experiences have suggested that 1-5% of the labels become detached during transport or handling. Procedures must therefore accommodate the fact that some logs will arrive at the destination without labels. Conventional labels aim to tighten the planning controls on *O. lanceolata* utilization and at the same time to ensure that the interests of the communities and land owners are fully taken into account through the specification of the Social Responsibility Agreements. This is important in getting information from the harvester where he/she intends to harvest from, in case of private land and or protected area for a pre-assessment to delineate the coup and determine the allowable cut for licensing and traceability (Bennet & van Hensbergen, 2011).

3.5.1 IMPLEMENTATION OF O. LANCEOLATA TRACKING

Guidelines for implementation tracking of the species have been developed and proposed below for Uganda, although these are not yet implemented.

- **Within the forest**

Information on quantities: Information on the amount of product in the forest is provided by good forest inventory data including standing volumes and diameter size distributions. Corresponding information on what has been harvested is provided by records such as log grades and dimensions. This information is systematically collected and compared. Critical points like forest exit should be taken into account.

- **While on transportation from the forest to factory or exit border point**

Securing the chain of custody of logs being transported to the mill or being sent for export is one of the most difficult challenges facing the wood products industry. One reason for this is that, this

stage is usually remote, spread over large distances, and poorly monitored. Therefore, it is the stage where both the system and the technology need to be relatively complex in order to ensure reliability. Forest to the factory or customs exit point of custody can include: Information on quantities: Information on the quantity of logs/wood recorded in the forest as discussed above, and again at the point of reception (e.g., the factory yard or the customs). These numbers should then be compared. In addition, information on quantities, particularly volumes or weights, is often required for transportation by truck and this information should also be used wherever possible.

Managing critical control points: The whole journey from the forest to the factory or exit border point includes the potential for mixing and should be treated as a critical control point. There are many different ways of controlling this, ranging from sophisticated marking of individual logs using high-tech labels or markers to simple, document-based systems for low- value wood based on control of transport.

- **Moving material between processors**

Chain of custody between processors tends to be controlled by comparing information on what the supplier sells with information on what the customer purchases. This is usually done from order forms, sales documents, invoices and transport documents including customs declarations where available. However, it is also possible to use segregation, such as packing product on pallets, in containers or in boxes, simultaneously with identification through labelling of products (Dykstra et al., 2002).

3.6 MANAGEMENT MEASURES OF O. LANCEOLATA IN UGANDA

3.6.1 MANAGEMENT MEASURES WITHIN THE COUNTRY

The management of tree populations is most effective if carried out strategically, rather than in a reactive or sporadic way. A coordinated approach, where stakeholders are fully engaged, is cost effective and ensures that continuity of tree benefits is achieved (AVDC, 2009). The *O. lanceolata* management strategy for Uganda has been developed and it identifies 8 main best practices described below:

3.6.1.1 STRATEGIES AND ACTIONS

There are five strategies and respective action plans that have been developed and aimed to work towards achieving sustainable management or conservation goals of *O. lanceolata* in Uganda.

Strategy 1: *O. lanceolata* conservation and recovery strategy

This strategy aims at conserving *O. lanceolata* habitats and ecosystems for long-term sustainability so that Ugandans can benefit from their multiple functions. Concerted efforts should be made to protect existing populations, habitats and ecosystems. There should be recovery plans aiming at re-establishing the species where they once existed. Other plans should aim at exploring other sites outside its natural range as an ex-situ effort for scaling up.

Required actions for strategy 1:

- Implement species conservation and recovery programmes
- Rehabilitate areas that have previously been degraded
- Extend green corridors to counter fragmentation
- Develop *O. lanceolata* special management plans for those populations in protected areas for their conservation
- Foster access and benefit sharing with the communities'/land owners' to ensure that the species conservation is considered when granting access to traders
- Establish *O. lanceolata* trials, demonstration/experimental plots outside its natural range to seek opportunities for ex-situ conservation and possibilities for commercial plantation establishments in a larger scale.

There is therefore, an urgent need to conserve the species in its natural habitats, rescue them from areas undergoing land use changes; and increase their numbers through seed planting, cuttings and tissue culture and keeping them in secure areas for protection as an ex-situ conservation strategy. This calls for concerted efforts to protect existing populations and or individuals for posterity. Habitats can be enhanced by replanting degraded areas, developing and/or improving established plantations. These activities can be carried out in conjunction with other agencies, so that sufficient stands of *O. lanceolata* are available across the country.

Strategy 2: Consider biodiversity issues in budgeting, policy and decision-making

Natural resource management is a very demanding effort more so to a developing country like Uganda as the multi-sectoral use of natural resources becomes increasingly more complex, requiring the balancing of development, public health and conservation goals. In fact, all the raw materials for any developmental venture are got from natural resources like forests and trees, and yet budgetary allocations do not match the requirements to manage these resources sustainably owing to the much pressure imposed by the communities and the private sector. It is therefore important to have strong policies protecting *O. lanceolata* in Uganda backed by reasonable budgetary allocations and sound decisions at all levels. Such decisions start right from the local communities who are at the fore front in its protection and management.

Strategy 3: Increase knowledge of *O. lanceolata* and its natural environment

Keen knowledge of how the key ecosystems respond to our activities will enable us to conserve and use them in a sustainable manner. It is essential that we conduct periodic stand inventories to determine the stand growth performance over time including ecological research in this era of climate change.

Actions for strategy 3:

- Encourage and facilitate research in ecosystem and *O. lanceolata* conservation, the interactions between the species and its physical environment, *O. lanceolata* valuation studies and the impact of climate change on the species
- Monitor the health of *O. lanceolata* as part of the management process
- Compile case studies on and assess best silvicultural practices implemented in the experimental plots

Strategy 4: Enhance education and public awareness

Knowledge and awareness are pre-requisites for action, hence communication on *O. lanceolata* issues is critical in driving public involvement. Effective communication will create greater awareness, interest in *O. lanceolata* and instil a sense of natural liking for the species.

Actions for strategy 4:

- Increase appreciation, awareness and understanding of *O. lanceolata* through public seminars, meetings, workshops shows and events and print, audio-visual and social media

- Promote volunteerism through biodiversity interest groups
- Incorporate elements of biodiversity conservation into the curricula of all levels of education
- The public can also participate in conservation education efforts conducted by organizations and interest groups.

Strategy 5: Strengthen stakeholder partnerships and promote international collaboration

The most effective mode of operation for natural resource conservation is by engaging all stakeholders including private and public sectors (government agencies, academia, schools, conservation groups and private corporations), in a strategic partnership arrangement. Such partnerships should be pursued domestically and internationally as natural resource issues cut across sectors and transcend national boundaries.

Actions for strategy 5:

- Engage in participatory resource management arrangement with the local community/groups
- Encourage active participation in the stewardship of *O. lanceolata* for all sectors
- Promote partnerships with regional and international organisations.
- Stakeholder meetings to protect the species to take part in a wider consultation to provide inputs and share ideas on potential priorities to be used to inform management efforts.
- Need to generate bye laws to improve the protection of the species in the wild from illegal and over exploitation.
- Develop and enter into memorandum of understanding with key stakeholders with well spelt roles and responsibilities.
- Enter into Private Public Partnership arrangement with private sector organizations for proper management of the species
- License a local small-scale processing plant to demonstrate sustainable harvesting methods

Strategy 6: Coppice management

O. lanceolata mainly grows in rocky areas and in association with a number of woody species across its habitat. As it was noted in the MWE (2021), the species rarely regenerates by seed, rather by coppicing which calls for application of techniques for coppice management.

Actions for strategy 6

- Once a tree for harvesting has been identified, cutting must be carried out as low as possible (≤ 30 cm from above the ground as appropriate).
- The cuts left on the stumps must be smooth and slanting downwards to avoid desiccation and encourage coppicing.
- Mulch, cultivate the surrounding soil and protect the young shoots from any threats
- *O. lanceolata* has a tendency of over sprouting. The extra shoots must therefore be thinned to allow the selected ones grow rapidly to the required utilizable size.
- Coppicing rotation can be maintained up to when the stems shall reach required harvesting size roughly between 7-10 depending upon the conditions of the location, soil, and altitude and management intervention given.

Strategy 7: Species monitoring, vigilance and law enforcement

Uganda has well established structures in most of the districts where *O. lanceolata* grows. It is therefore incumbent upon the District Natural Resource Officers, District Forest Officers and District Environment Officers to protect the species within their areas of jurisdiction. Community vigilantes should be set in hotspot areas to inform, alert and watch over the species in their areas. With the available policies, laws and regulation, law enforcement measures should be observed where culprits must be apprehended and handed over to court to act as an example for the rest. In this way, the offices of Uganda police, local council offices should be made use of, right from lower levels in villages to the office of district chairperson five.

3.6.2 CONTROL AND MONITORING

Monitoring and control of trade in Sandalwood in Uganda is charged with different institutions at the national and local levels. At the national level, the institutions include Forest Sector Support Department (FSSD), National Forestry Authority (NFA), CITES Management Authority under the Ministry of Wildlife, Tourism and Antiquities, Uganda Wildlife Authority (UWA), Uganda Revenue Authority (URA), and Environmental Police. At the district (local) level, there is the

District Natural Resources Office (DNRO), the District Forestry Services (DFS) and the District Police Office.

Despite the presence of such structures at the national and local levels, Uganda lacks a well-established system of tracking/monitoring and control of the trade in Sandalwood. This can be attributed to the porous nature of the borders especially the Kayoro boarder point in Kayoro sub county, Busia district and along River Malaba in Mela sub county, Tororo district. Other limiting factors include the remote ecological distribution of the species as well as limited infrastructural capacity of the respective entities.

The reported monitoring and control of illegal trade is not limited to Sandalwood but also other forestry products especially from threatened tree species. The district officials monitor twice a month and also when alerted by community members about illegal trade in Sandalwood, charcoal, and any threatened tree species. During monitoring, road blocks are mounted on main roads as well as routes thought to be used by illegal traders. Monitoring and control of illegal trade in Sandalwood is complex because the business is secretive, lucrative and highly sophisticated. The local people provide information to the local leaders about any suspicious activities. Through this network, the leaders are able to acquire timely information and on average, 2-3 cases of illegal trade in Sandalwood are recorded in a year.

3.6.2.1 CAPACITY IN MONITORING AND CONTROL OF ILLEGAL TRADE IN SANDALWOOD IN UGANDA

The responsible stakeholders and institutions in Uganda have limited capacity to monitor and control illegal trade of Sandalwood. Earlier reports noted that few people both at the district and community level are able to identify Sandalwood (the leaves, bark and roots) and its uses. The people that could vividly identify Sandalwood were the District Forestry Officers, the Forest Rangers, herbalists, Charcoal dealers/makers, and elderly people of the community. At the district level, no specific trainings or financial support are directed towards monitoring and control of illegal trade in Sandalwood in Uganda. The trainings held are mostly concerned with environmental protection, river bank restoration and management, tree planting, disaster preparedness and management among others. These trainings are sometimes organized by District Natural Resources Office, NGOs, and programmes such as NUSAF, REDD+, FIEFOC among others. Although the trainings offer knowledge that is applicable in the monitoring and control of

Sandalwood, they are rarely held and when organized, the senior officers are majorly considered for training.

3.6.2.2 MEASURES IMPLEMENTED TO MONITOR AND CONTROL ILLEGAL TRADE IN SANDALWOOD

The government and other development partners have implemented several activities geared towards environmental protection. Some of the partners include World Vision, PLAN International, GIZ, ACEMD, Mercy corps, KADF, CARITAS International. Additionally, CTSP funded “Conservation and Sustainable Management of *Osyris lanceolata*, for Economic Development in East Africa” project is being implemented in Uganda. The following measures have been implemented in Uganda to generally protect and conserve the environment, including protecting Sandalwood in the wild;

- Sensitization and support of communities to plant exotic and indigenous tree species to reduce the pressure on Sandalwood for firewood.
- Building the capacity of local communities to establish tree nursery beds of *Eucalyptus* spp *Grevillea* spp, *Pine* spp among others on private farms.
- Implementation of bye-laws on tree cutting, bush burning, charcoal burning and environmental protection. For example, Nakapiripirit district has an ordinance on food security and environmental protection, 2012.
- Mounting road blocks on both major roads as well as routes sought to be used by illegal traders. Checks are made to establish trucks carrying threatened forestry products, Sandalwood and Charcoal.
- Establishment of the national wildlife crime coordination task force which includes different government law enforcement agencies such as NFA, DPP, UWA, Police, Customs, ESO, Immigrations, UPDF, Wildlife Conservation Department-MTWA, and NEMA. The taskforce nominates a focal point person for different regions to increase coordination of the activities with the aim of increasing intelligence on trade in threatened spp, but also eliminate sectorial mismanagement of cases of illegal trade.

3.6.2.3 GAPS IN MONITORING AND CONTROL OF ILLEGAL TRADE IN SANDALWOOD IN UGANDA

The following are the gaps in monitoring and control of illegal trade in Sandalwood in Uganda;

- There are no guidelines, regulations or ordinances/bye-laws to regulate the harvesting, production, and trade of Sandalwood in Uganda.
- There is limited enforcement in the monitoring and control of trade in Sandalwood. The frequency, personnel and materials such as motor bikes and vehicles, for monitoring trade in Sandalwood are few.
- There is political interference in handling cases for Sandalwood illegal trade. Political leaders at the district and national levels have been reported to influence prosecution of culprits of Sandalwood illegal trade.
- There is corruption in the management of Sandalwood illegal trade. Cases have been recorded where culprits of illegal trade are released on police bond, cases dropped, and the impounded Sandalwood sold illegally.
- There is no established system of tracking or monitoring the trade in Sandalwood.
- Limited training of the relevant stakeholders regarding the identification, monitoring and control of illegal trade in Sandalwood.

3.6.2.4 CHALLENGES IN MONITORING AND CONTROL OF ILLEGAL TRADE IN SANDALWOOD IN UGANDA

The following are the challenges encountered by the enforcement team in monitoring and control of illegal trade in Sandalwood in Uganda.

- There is limited access to information regarding the compliance of legal traders. The legally registered companies hardly declare the sources of Sandalwood, the production capacity, and products exported.
- The complex nature of the illegal Sandalwood trade. The illegal traders easily adjust to different forms of concealment to hide their products in transit and avoid being caught. They regularly change to different routes and have a large network of informants in the local areas.
- The lack of environmental police/guards at local districts obscures monitors from interfacing with illegal traders, who are in most cases armed with guns and bows.
- There is limited facilitation in terms of motorcycles, fuel, and other logistical support such as field allowances for the monitoring teams.

- There is political interference in curbing of illegal trade in Sandalwood. The informants also reported high corruption levels within government since the trade activities are very lucrative and the traders are willing to pay large sums of money to compromise the prosecution processes.
- There is limited staffing in the monitoring of trade activities of Sandalwood, therefore, some of the illegal activities go unnoticed.
- There is limited awareness of Sandalwood among the law enforcers. The study showed that some of the enforcement team cannot identify Sandalwood and do not know the implications of the trade on the survival of the species.
- Due to high poverty levels in the communities where the species exists, the local people connive with illegal traders to harvest and sell the species and obtain immediate survival.
- The monitors use motorcycles in the field compared to illegal traders who use trucks, Lorries and in most cases move in groups. It is therefore difficult for the monitors to stop the illegal traders along the way.
- The porous nature of international borders makes it difficult to restrict illegal movement of materials between countries.
- Endless civil unrest in neighbour countries often limit engagement of different responsible

3.7. CONSERVATION CONTEXT AND PRECAUTIONARY PRINCIPLE

3.7.1 CONSERVATION CONTEXT

Following the popularity of Sandalwood oil from *Osyris lanceolata*, its numbers have greatly reduced. Since the essential oil is more concentrated in the roots, couple with other benefits offered by this tree species, the whole tree is normally harvested and given its slow regenerative ability, its recruitment is greatly inhibited (Kamondo et al., 2014).

Uganda acceded to the Convention on International Trade in Endangered Species (CITES) on July 18th 1991 and the Convention came into force in October, 1991. In accordance with the CITES guidelines, Uganda has one management authority which is also the national focal point, i.e., Ministry of Tourism, Wildlife and Antiquities and three scientific authorities: Ministry of Water and Environment (MWE) for flora, Uganda Wildlife Authority (UWA) for fauna and Fisheries Department for fish. Currently, there are 3 major plant species listed under CITES for which

Uganda is a range state: *Encephalartos* species (Cycads), *Prunus africana* and *Osyris lanceolata*. *O. lanceolata* was listed under Appendix II in 2013 (Cop 16).

The population of *O. lanceolata* in Uganda has not been adequately documented but the expert opinion suggests that the highest population of the species is found in the Karamoja region where harvesting on a commercial scale has been on-going. Although the MoU between Moroto local government and Sky beam expired in 2017, there has been continued unsustainable harvesting of *O. lanceolata* in Karamoja region and exportation of Sandalwood products from Uganda (Ahmed, 2018). To this end, a circular from MWE was released to curb illegal trafficking and overexploitation of Sandalwood in Uganda. The circular clearly detailed which company was permitted to process Sandalwood in Uganda and shows that all Sandalwood exports from or through Uganda should have a CITES permit, otherwise they would be considered illegal and deserved to be impounded.

Besides being listed in Appendix II of CITES and the MWE circular, there are no documented conservation efforts of *O. lanceolata* in Uganda. Nonetheless, given its rising importance for its scented wood and extraction of essential oil, many organizations and individuals are now engaged in conservation or research on sandalwood in Uganda.

3.7.2 MAIN THREATS

Amongst the districts where the species has been recorded in Uganda, higher threats are reported in the districts of Amudat, Bukwo and Moroto thus being put in category A'. Nakapiripirit and Kaabong have low or even no human threats in addition to protected areas, therefore being put in category B'. The MWE report (2021) concluded that *O. lanceolata* had generally declined in the wild, with one of the causes being over exploitation and trade on the species due to the lack of strategic management of the species. By developing this strategy for the management of *O. lanceolata* in Uganda, it is considered that the planned best management practices shall deliver the species enhancement and protection for sustained social, economic and ecological benefits of the community, Uganda as a country and the international communities at large (LUC, 2016).

Given its commercial and cultural importance, *O. lanceolata* is mainly threatened by trade and overharvesting for other uses such as charcoal, fuelwood, medicine and food. Although there are

no documented studies of threats to *O. lanceolata* in Uganda, we presume some of the threats basing on its usability and distribution. Hence, the main threats include but are not limited to:

- The harvesting mode for sandalwood oil extraction which involves uprooting the whole tree;
- Fuelwood harvesting and charcoal burning;
- Harvesting plant parts for medicinal purposes and craft industry;
- Increased exploitation of the host species;
- Conversion of *O. lanceolata* habitats to other land uses such as agriculture and human settlements;
- Pests and diseases;
- Invasive species; and
- Climate change.

3.7.3 SPECIFIC CITES REGULATIONS AND PROVISIONS

The Convention on International Trade of Endangered Species (CITES), 1973: It aims at ensuring that international trade in specimens of wild animal and plant species does not threaten their survival. Uganda ratified the CITES in 1991 and acknowledged the need for international co-operation to combat trade in endangered species. At the 16th meeting of the Conference of Parties (CoP) to CITES, Bangkok, Thailand, 2013, the populations of *Osyris lanceolata* of East African countries were listed in Appendix II. The listing followed consultations among the Eastern African Range States and submission by Kenya of a proposal to the CoP, to include the East African Sandalwood in Appendix II. The Conference of the Parties, alongside the species listing, adopted Decisions 16.153 & 16.154 on actions for implementation to enhance the conservation of the species across its range. Therefore, it is a fundamental obligation of CITES member countries to present a non-detriment finding (NDF) prior to any export of a product listed in Appendix II of the Convention.

3.7.4 CITES MANAGEMENT AUTHORITY

The CITES Management Authority of Uganda is housed under the Ministry of Tourism, Wildlife and Antiquities. The Authority is responsible for issuing CITES permits for wildlife species which

are found in Appendix I, II, and III of CITES. The Authority seeks advisory services from the Scientific Authority for plants of wild origin, Forestry Sector Support Department– Ministry of Water and Environment on licencing a company or an individual to trade in a threatened species or species that are not necessarily threatened with extinction but may become so unless trade is closely controlled. *Osyris lanceolata* is listed under Appendix II of the Convention on International Trade in Endangered Species (CITES) and therefore, trade in this species requires a CITES permit in Uganda.

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