



Somaliland's Frankincense Trade

Challenges, Choices, and Sustainability

Findings and Executive Summary

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This is the second of the 2016-2017 reports on the status of the frankincense economy and Boswellia forests. It covers the field analysis conducted by the Conserve the Cal Madow team during January 2017. The first report, of the field analysis in October 2016, can be found here:

http://www.conservethecalmadow.org/wp-content/uploads/2016/12/Frankincense_Major_Findings_October_2016-1.pdf

Map of the growing region:

Below is a map of the growing region, with pins indicating where analysis has been conducted. These areas represent approximately 400 tonnes of resin production per year. Somaliland production is approximately 800 tonnes, with 400 additional tonnes from Puntland for a total Somali production of approximately 1200 tonnes. Thus, we have been at sites representing approximately 50% of Somaliland's production (based on key informant interviews with exporters, distilleries, and international buyers).



Figure 1. Map of the growing region. Pins indicate locations we have visited.

Map of surveyed harvesting locations. Between September 2016-January 2017 we conducted field analysis in and around the locations marked by the red pins. During January 2017 we visited four new locations, three of which were roadless areas and extremely remote (minimum 20km hike to trees). In addition to the core scientific team we also added two technicians from the Ministry of Environment who worked on these locations with us.

We have visited areas with roads and areas that are road less; areas with and without permanent settlements; areas close to human settlements and areas that are extremely remote; extremely arid areas and areas with relatively high levels of precipitation and/or fog; areas with high and low density of frankincense trees. We have also examined differences between *carterii* and *frereana* trees. The areas that we've conducted analysis on represent more than half of the *carterii* resin production in Somaliland.

2. Well Managed Areas

During the January-February 2017 analysis in the growing region, we assessed 2 sites that are actively well-managed. These areas are vibrant and have robust, healthy frankincense *carterii* trees. These areas can and do provide a wealth of high quality resins for the international market. Their ecological and economic significance is of major importance to the continuation of the frankincense trade. The existence of these well managed areas is encouraging for the health of Somaliland's frankincense trade.

The two sites differ ecologically and offer an ideal comparison of appropriate management in different ecological zones. Location one is in the western growing region, on the western edge of the escarpment, with a largely arid climate and less vegetation. The density of *Boswellia* trees here is low, and mists, while present, are limited. Location two, by contrast, is in the eastern growing region, north-facing, just below the escarpment. It experiences higher levels of precipitation and frequent mists, leading to higher levels of biomass and a greater density of *Boswellia* trees. Trees were fully foliated with turgid, high-chlorophyll leaves, in contrast to the marginal leaf loss characteristic of overstressed trees.



Figure 2. Location One. This area is dry and lower elevation.



Figure 3. Location Two. This area is higher in elevation and much wetter than Location One.



Figure 4. Well-managed tree in Location Two.



Figure 5. Well-managed tree in Location Two.

“Well-managed” here indicates that the harvesters were treating trees either in accordance with, or in close approximation to, the traditional knowledge standards of care that we have determined through literature review and interviews with knowledgeable elders (Appendix 1). We can state that an area is well-managed if it meets the following standards:

- 1). A harvesting period that does not exceed 6 months
- 2). Only harvesting for a single season per year
- 3). Rarely or never placing more than 12 cuts on a single tree
- 4). Allowing trees to rest periodically
- 5). Harvesting only adult trees, not seedlings
- 6). Making only shallow cuts into the bark

We assessed the health of a site both visually and through interviews with the harvester(s) and landowner(s) who work in the area. Interviews entailed discussing harvesting and tree care practices as well as environmental social, and economic issues in the industry. While not necessarily a metric for assessment, we have noticed a correlation between good management of the trees and extensive knowledge and a sense of cultural pride in the harvesters.

Visual assessments were performed both in person and technologically. We assessed both the evidence of harvesting (the number of new and old wounds, open wounds, etc.) and the condition of the tree. Trees that are healthy and well-managed have thick, full canopies with open leaves on every branch. Trees that are being overharvested or are in poor health display branches without leaves and leaves that are smaller and curled. Frankincense trees are hardy, and can remain healthy through 1-2 rounds of overharvesting if large amounts of water are available. However, long-term overharvesting will cause leaf loss and tree decline (Al-Aamri 2014). We observed that well managed areas have higher densities of seedlings, indicating that trees that are less stressed can reproduce and regeneration better than trees stressed by overharvesting (Rijkers et al. 2006).



Figure 6. An appropriate first cut on a *Carterii* tree.

3. Knowledge and Best Practices

The frankincense trade in Somaliland is ancient, potentially stretching back as far as 6,000 years as a supply for ancient Egypt. As a result, there is a long-standing body of cultural knowledge on how to properly manage the trees. This knowledge has been codified through the traditional legal system, called Xeer law. These laws provide a comprehensive set of rules guiding how and when trees are harvested, how harvesters and traders must treat each other, and how disputes may be resolved. These laws have kept the harvesting sustainable and the trading ethical for thousands of years. In the well-managed areas, the harvesters are still adhering to these rules. We noted that in these areas, the landowners/leaders tended to be older, and were the people doing the harvesting. In the areas with higher levels of overharvesting and greater breakdown of the traditional practices, harvesters tended to be younger and less experienced, newer to the job.

Promoting sustainable management means reviving the traditional sustainable practices while using scientific knowledge and techniques to augment these efforts under a climate change scenario. Support from external buyers will be critical to ensuring that market incentives are provided to help maintain these practices. Luckily, the traditional knowledge provides detailed

guidelines for harvesting techniques, which establishes Best Practices to follow for sustainable resin production.

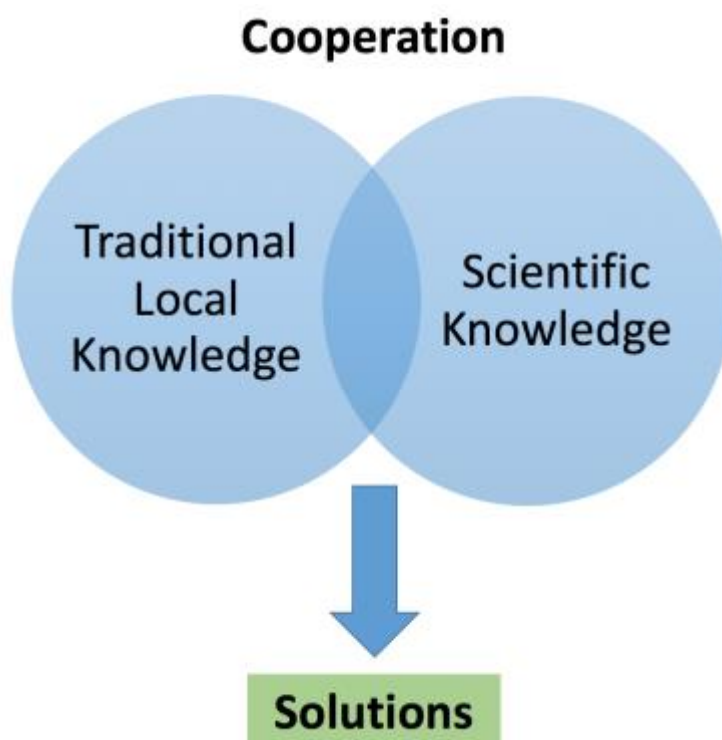


Figure 7. Cooperation between elders holding traditional knowledge and scientists is required to come up with solutions for sustainable management of the trees.

Through literature review of documented practices, studies from Oman and Ethiopia, and interviews with elders and older harvesters, we have determined the following key practices to follow (Appendix 1 for references). This chart is an excerpt from the full report on Best Practices.

Best Practices for Resin Harvesting

	B. Carterii (Beeyo)	B. Frereana (Maydi)
Age of First Harvest	First tapping at 15-40 years old Only tap trees greater than 10cm DBH	First tapping at 15-40 years old Only tap trees greater than 10cm DBH
Harvesting Season	April-October (Xagaa) Harvesting outside this season is highly damaging to the trees.	September-June (Deyreed) Harvesting outside this season is highly damaging to the trees.

Resting of Trees	<p>Tap trees for 2 years, then rest for 1 year. Rotate the trees being tapped, so some are tapped each year and some are rested each year.</p> <p>Not all trees produce good resin</p> <p>If the milk does not immediately come out when cut, the tree should be rested.</p> <p>If the resin is red, the tree should be rested.</p>	<p>Tap trees for 2 years, then rest for 1 year. Rotate the trees being tapped, so some are tapped each year and some are rested each year.</p> <p>Not all trees produce good resin</p> <p>If the milk does not immediately come out when cut, the tree should be rested.</p> <p>If the resin is red, the tree should be rested.</p>
Cutting Cycles	<p>8-10 cutting cycles</p> <p>First 3-5 cycles produce little resin. High resin production on cycles 6-8.</p> <p>15-20 day intervals between cutting cycles</p>	<p>8-12 cutting cycles</p> <p>Best resin produced in the later cycles</p> <p>15-30 day intervals between cutting cycles</p>
Number of Wounds	<p>Trees should receive 3, 6, or 9 cuts depending on size</p> <p>Young trees should not have more than 3 cuts</p> <p>The largest, oldest trees should not have more than 10-12 cuts</p>	<p>Trees should receive 3, 6, or 9 cuts depending on size</p> <p>Young trees should not have more than 3 cuts</p> <p>The largest, oldest trees should not have more than 10-12 cuts</p>
Size of Wounds	<p>The first cut should not be bigger than 3cm x 4cm</p> <p>Each cutting cycle makes the wound slightly larger</p> <p>The final wound should not be bigger than 6cm x 10cm</p>	<p>The first cut should not be bigger than 3cm x 4cm</p> <p>Each cutting cycle makes the wound slightly larger</p> <p>The final wound should not be bigger than 6cm x 10cm</p>
Placement of Wounds	<p>Wounds should be made in a channel along opposite sides of the trunk only</p> <p>Wounds should be at least 30cm apart</p> <p>At low elevations, wounds should be made on sides opposite winds and sun.</p> <p>At high elevations, wounds should be made on sides facing winds.</p>	<p>Wounds should be made in a channel along opposite sides of the trunk only</p> <p>Wounds should be at least 30cm apart</p>
Gathering Resin	<p>Resins should be removed at each 15-20 day cutting interval</p> <p>Resins should only be removed when they are no longer sticky</p> <p>Resin should be harvested at each interval</p>	<p>Resins should be removed at each 15-30 day cutting interval</p> <p>Resins should only be removed when they are no longer sticky</p> <p>Resin on the wound should be harvested at each interval, but resin running down to form tears should be harvested on the final cycle</p>

4. Challenges of Overharvesting

The overharvesting and mismanagement we have observed is due to myriad factors, social, economic, and environmental. Rising prices for the resin and an ever-increasing population has resulted in many young, relatively untrained harvesters cutting trees aggressively to take advantage of the prices. However, while these young harvesters may lack the knowledge to properly care for the trees, such traditional knowledge is held by local elders.

The market for *carterii* resin has dramatically risen over the last decade due to both international demand and to the war in Yemen, which impeded the trade in frankincense. This resulted in harvesters focusing their attention on the *carterii*, and harvesting of these trees is higher than it has ever been. *Carterii* prices have historically been low, and have recently risen by 600% as a result of this shift, without formal environmental controls. This can understandably encourage people to cut as much as possible, in order to take advantage of the higher prices. Simultaneously, families have continued to grow, resulting in larger numbers of young people in need of jobs. Few opportunities exist outside of frankincense harvesting, and consequently many of these young people become harvesters. The rush to take advantage of high resin prices has resulted in many untrained young harvesters working, and thus a consequent loss of traditional knowledge amongst the younger generation. This has not been aided by an influx of the addictive narcotic khat, which has further increased a desire for quick income.

Untrained harvesters often think that over wounding and cutting deeply will cause the trees to produce more resin, but according to both elders and scientific studies, this is not true and will lead to a decline in tree health. Moreover, this leads to a decline in the quality and chemical composition of the resins, often making them unsuitable for oil production. In recent years, harvesters have been performing a second, winter harvest, which yields lower quality resin and damages the trees' ability to protect themselves. Most of these unsustainable practices are banned by traditional knowledge and xeer law.



Figure 8. Trees that are being overharvested, with far too many wounds. These trees have likely survived because it is only the second time being overharvested and the area is exceptionally wet.

5. Carterii and Frereana differences

Despite both being referred to broadly as frankincense, *Boswellia carterii* and *Boswellia frereana* are distinct entities both ecologically and economically. Until the last decade, *frereana* was the most harvested *Boswellia* species in Somaliland and the largest resin export. Currently, the market has shifted and now *carterii* is the most harvested *Boswellia* species in Somaliland and the most exported.



Figure 9. *Boswellia carterii* tree.



Figure 10. *Boswellia carterii* leaves.

Boswellia carterii grows as low in elevation as 5 meters above sea level, but is generally found between 500 and 1400 meters, with the middle of that range preferred in a specific niche along the Gollis mountain range (Thulin and Warfa 1987; pers. obs.). *Carterii* trees grow on dark, volcanic rock, though they occasionally put roots down into adjacent soil, and have a stronger affinity for water than *frereana* trees. The *carterii* trees prefer areas with high rainfall and frequent mists, and produce resin best when in these areas. In good conditions the trees often grow with a single trunk, and have flat, dark green leaves. These trees are harvested between the major rainy seasons (broadly May-September) as hot weather is said to improve the resin quality. *Carterii* trees produce a resin locally known as *Beeyo*, which has a lighter, sweeter scent than *frereana* resin and is most commonly distilled into essential oils for cosmetic and aromatherapy applications. The *carterii* market has dramatically increased over the past 6-7 years, resulting in higher levels of harvesting than previously seen in Somaliland.



Figure 11. *Boswellia frereana* tree.



Figure 12. *Boswellia frereana* leaves.

By contract, *Boswellia frereana* trees grow from 5-750 meters in elevation, preferring the 5-500m band, in hotter, drier climates (Thulin and Warfa 1987). They prefer red volcanic rocks and are generally hardier than *carterii* trees. They form many trunks and have light green, undulating leaves. In contrast to *carterii*, *frereana* is harvested after the second rainy season, generally October-April. The *frereana* trees produce a resin that has a deeper, earthier smell than *carterii* resin. While it is distilled into essential oil as well, the main *frereana* market is for the resin itself. The *frereana* resin—unlike the *carterii* resin—forms large tears which are prized as chewing gum in Saudi Arabia. Historically, the resin was shipped to Yemen and then on to Saudi Arabia. The civil unrest and subsequent war in Yemen has blocked this trade route, and in the absence of alternative routes the *frereana* market has significantly decreased, resulting in lower levels of harvesting of the *frereana* trees and greater harvesting pressure on the *carterii* trees.

6. Bans

During the January 2017 field assessment it came to our attention that false rumors were being circulated that the scientific team was in favor of banning the sale of Somaliland's frankincense. This is false. The team has never conducted any analysis aimed at a ban. Furthermore, there are no discussions with the United Nations, foreign governments or the government of Somaliland to ban. There is no movement to ban Somaliland's frankincense. In fact, conservation bans, in this type of situation have been tried and have proven to be unsuccessful in many cases. A ban could potentially create negative consequences such as a strong informal economy, reduce tax revenue for the government, lower the price per kilo for harvesters, accelerate conflict and corruption and worsen environmental conditions and tree health. Thus we support sustainable forest management and harvesting methods, job creation and community development. Thousands of people rely on the trees for their livelihoods. A sustainable balance and increased prosperity is possible if the stakeholders in this industry cooperate (Mamba 2015, Duffy et al. 2003, Portela 2011).

7. Understanding new markets and empowering landowners

There is a lack of understanding of the international market among many Somali landowners. The increased demand for *Carterii* in a short period of time has shifted the market. The international buyers especially in the essential oils or natural cosmetics industries require high quality, non-contaminated, and well-managed trees to produce the resins they require for their products. This is less of a concern for companies that adulterate the oils such as the synthetic perfume industry.

What is emerging in the data, from distilleries and independent laboratories, is that not all resins are equal. Some resins contain high levels of chemicals not suitable for oil production. Moreover, overharvested trees often do not have the right ratio of resin to oil to gum for cost-effective oil distillation. There are also cases of resins that are not *Carterii* (or *Frereana*) being mixed with the *Carterii*. This may be difficult for exporters to spot but it becomes clear once the resins are tested in the laboratory; the mixed chemical profile indicates multiple species and the shipment is rejected. In fact, some laboratories report chemical profiles of resins they have never seen before and could be a new or unidentified species but are clearly not produced by *Boswellia carterii*. Lastly, many distillers report a general decrease in resin and oil quality over the last few years.

Ultimately, landowners need to be educated about the market and buyers need to:

1. Encourage sustainability and tree health
2. Ensure they are receiving a fair price
3. Have knowledge about what type of resin their trees produce
4. Identify best markets for their product
5. Consider types of production other than only resins for oils or limited resins for the middle east.

8. International Buyers and collaborative efforts

It is clear that the exporting companies and the international buyers have an important role in ensuring this trade continues, equitably, long term and sustainability. This is especially the case in Somaliland where the government has limited resources to be able to regulate. Landowners and harvesters who may be caught in a poverty trap cannot be expected to carry the responsibility for protection of these trees and forests alone. The international demand comes with a responsibility to invest back into communities, not only through a fair price but also through strategic community investments.

Furthermore, the exporters and buyers must account for their demand and the impact that it is having on tree health and forest as a whole. Companies can take advantage of their buying power by demanding and stewarding sustainable management of the trees through continued research, education and outreach, incentivizing sustainability monetarily, supporting

diversification of economic activities, and cooperation/collaboration with stakeholders including landowners, communities, chiefs, government, researchers and other companies.

9. Next Steps

With support from the international buyers who accept responsibility for the demand that they create, we have support to roll out these next steps.

- Release of best practices
- Awareness raising and training on best practices for harvesters
- Analysis of potential development investments in communities
- Verification process that monetarily rewards harvesters that manage their trees sustainably
- Continued research on tree health and ways to make the trees more productive

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Appendix 1

Summarized version of statements provided by interviewees on issues and traditional practices. Complete table available upon request.

Total Participants: 179			
Row	Issue	Participants	Sources
1	High levels of overharvesting	49	12 (EFE/CF 10/9; GB 10/8; MMH 10/11; GBC 10/12; RQ 10/13; AJC 10/13; BWP 10/15; GE 10/10; BH 9/30, HSH 10/23; BOS 11/2; GBCH 10/12; NBC 10/20; AMW 10/12)
2	Adult trees are dying	38	8 (IJ 10/6; EFE/CF 10/7; GB 10/8; MMH 10/11; RQ 10/13; BWP 10/15; GBC 10/12; GE 10/10)
3	Lack of industry regulation/cooperation causing conflict	49	13 (BH 9/30; EFE/CF 10/9; GB 10/8; MMH 10/11; GBC 10/12; IJ 10/6; BWP 10/15; NBC 10/20; AJC 10/13; AD/A 10/5; HSH 10/23; AMW 10/14; BOS 11/2)
4	Distrust of the World Bank and other NGOs	86	5 (BAM 10/6; MMC 10/11; GBC 10/12; RQ 10/13; AJC 10/13)
5	Distrust of Central (Hargeisa) government	76	6 (BAM 10/6; GBC 10/12; RQ 10/13; MP 10/19; HSH 10/23; AJC 10/13)
6	Feel that companies have abandoned them	25	3 (MMC 10/11; RQ 10/13; AJC 10/13)
7	Communities need projects (Infrastructure, education, clinics, etc.)	52	3 (EFE/CF 10/9; GBC 10/12; RQC 10/13)
8	Dwindling resin output and quality	42	6 (MMC 10/11; MH 10/16; NBC 10/20; GBC 10/12; HSH 10/23; BOS 11/2)
9	Multi-level cooperation necessary to protect trees	26	5 (GBC 10/12; NBC 10/20; BH 10/20; HSH 10/23; AJC 10/13)
Total Participants: 23			
Traditional Practices		Participants	Sources
10	Age of first harvest is 40 years or ~ 10cm	3	3 (Al-Aamri 2014; GE 10/10; MSM 1/27)
11	Tapping cycle is May-Oct for carterii and Sept-May for frereana	9	4 (IJ 10/6; GB 10/8; HSH 10/23; GE 10/10) + Farah 1994; PDRC 2003
12	No more than 6 months of tapping; 3 months is ideal	6	MMS 1/16, MK 1/17, MSM 1/27

13	8-12 tapping cycles for frereana, 8-10 for carterii; 15-30 day intervals	7	PDRC 2003; Farah 1994; MSM 1/27; MK 1/17; HSH 10/23; MK 1/20; Al-Aamri 2014
14	Last cycles yield best resin	3	PDRC 2003; Farah 1994; MSM 1/27
15	Trees must be rested after 2 years of tapping	5	PDRC 2003; Farah 1994; MSM 1/27; GE 10/10; Al-Aamri 2014
16	No more than 10-12 wounds/tree	11	EFE/CF 10/9, GE 10/10, MSM 1/27, Al-Aamri 2014; Eshete et al. 2012
17	Wounds should be small and shallow	9	MMS 1/16, GE 10/10, MSM 1/27, Al-Aamri 2014, Eshete et al 2012, Farah 1994
18	Wounds in a channel on opposite sides of the tree	5	GE 10/10, CF 10/9, Al-Aamri 2014; Eshete et al. 2012, MSM 1/27
19	Gather resin at each cutting interval, when non-sticky	7	PDRC 2003; Farah 1994; MSM 1/27; MK 1/20; HSH 10/23; MK 1/17; Al-Aamri 2014