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The Main Outcomes and Road Map

The Future of Frankincense Online Workshop

March 15th, 17th, 18th 2021.
1-4 pm GMT.

Three main messages

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1 Each of the 24 species of Boswellia are different and face different current conditions and threats. Differences mentioned in the workshop include different genetic pathways, phenotypes, ranges, needs, growing habits, habitats and regeneration patterns. The resins and oils also have different constituents, medicinal and aromatic properties and end uses. Each species has different dynamics of socio-economic and environmental management, or mis-management, ownership (or not), harvesting (or not). Gathering accurate information on the current ranges, status, mortality and regeneration rates and health of the different species and populations has consistently emerged as a top research priority

> *"Of course we should not treat frankincense as a single monolithic entity. We need to look at the different situation and threats that each individual species faces and not extrapolate from one species to the next."*

2 The frankincense value chain has many steps and currently a very small percentage of the overall profits return to the harvesters. Through focal group discussions organized with local scientists, harvesters, collectors, traders and researchers in Somaliland, Ethiopia, Kenya and Oman shared their requests for access to steady fair prices and markets, regulated working conditions, safety and protective equipment, food, water, healthcare, education and adult literacy, supportive infrastructure and community development.

3 To be able to sustain the long term future of the species and their products, and the long term commitment of the communities which depend on them, accurate information on the whole value chain is required. There is variation between species in sorting and storage, trade routes, local regional, national and international trade licensing and regulations and different pressures, threats and challenges. Targeted actions towards a sustainable future is currently scattered and limited. Moving forward depends on coordinated and focused information gathering, collaboration, research and action.

Focusing on Frankincense trees and the communities that harvest them

Frankincense is the resin produced in response to injury of the under bark of trees of the Boswellia species. There are currently 24 recognised species. Some species have limited geographical range. For instance, 11 species are endemic to the island of Socotra in the Red Sea between Yemen and the Horn of Africa. Yet together, Boswellia serrata, B.sacra, B.papyrifera, B.dalzielii, B.neglecta and B.rivae spread across at least 17 countries, from India, across the Arabian peninsula, the greater Horn of Africa to West Africa, with some individual species ranges spanning more than 2000kms[1]. The trees tend to grow in arid/semi-arid conditions, supported either by orographic moisture (B.sacra, B.frereana,) and/or seasonal rain (B.serrata, B.papyrifera, B.dalzielii, B.neglecta and B.rivae). Many trees grow in the relatively inaccessible areas where populations have access to limited resources. Gathering accurate information on the current ranges, status, mortality and regeneration rates and health of the different species and populations, has consistently emerged as a top research priority.

[1] E.g. *B. neglecta* spans from Northern Tanzania to Northern West Ethiopia

Frankincense is one of the oldest known globally traded products and has been a valued ingredient in Asian traditional medicine systems for millennia. Boswellia papyrifera from Ethiopia has for the last few decades been the most traded resin, both internally within Ethiopia and exported for religious and other purposes. Especially in the last decade there has been a surge in the use of the essential oils distilled from traded Boswellia resins for aromatherapy and other uses. Most frankincense commercial oil is extracted from Boswellia sacra (and B.sacra syn carteri) resin from Somalia/ Somaliland and Oman, with lesser amounts from Boswellia serrata, B. papyrifera, B. rivae, B. neglecta and B. dalzielii. So far four species, B.serrata, B. sacra, B. papyrifera and B. dalzielii, have also shown high levels of four main bioactive boswellic acids in the resin (not the essential oils or hydrosol). In vitro and in vivo research and one or two clinical trials using resin extracts of Boswellia serrata, sacra and other species have demonstrated anti-inflammatory, anti-microbial, fungal, viral and cytotoxic effects.

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The current and potential increase in demand for resin has led to a growing concern about the long term viability of the trees, the well-being of the harvesters and the harvesting practices; particularly in accessible heavily harvested areas. Many species face multiple challenges including grazing from livestock, fire, land conversion (for agriculture, roads, mining etc.), lopping and felling for household needs as well as climate, and environmental stress. The challenges may differ between species and between locations within the range where a species occurs. For some species and some areas we have little factual information. There are a few reports of extensive healthy forests of B.neglecta and B.rivae across the Somali region of Ethiopia and Northern Kenya, and natural regeneration has been reported in Oman, Sudan and Western Ethiopia. At the same time, there are well-documented reports of declining populations and a lack of regeneration in Ethiopia, Eritrea, Sudan, Somaliland and reports of decline of B.serrata in India[2].

There is very little documented information on the communities and harvesters themselves. According to one study over a quarter of a million people are estimated to be dependent on Frankincense for over 50% of their income in the East Golis / Saanag region of Somaliland alone[3]. With dependent forest tribes in Madhya Pradesh in India, to extra dry season income for Samburu women, to Somali clans living deep in the bush, the exact number of those for whom the currently small extra income ensures survival and access to food, water, healthcare and education is unknown. A major focus of this workshop has been to ask ‘What are the main gaps in our knowledge?’ and ‘What can we do?’.

Given the rising concern about the well-being of the trees and communities, a growing platform, named the Global Frankincense Alliance (GFA) was created by concerned individuals out of a special session on Frankincense and Myrrh at WOCMAP. At the same time, an informal working group on Boswellia had been initiated within the UN Convention on International Trade on Endangered Species (CITES) to gather accurate data on the range, status and health of the trees and how they may be being impacted by international trade. Due to COVID, the second International Conference on Frankincense and Medicinal Plants in Oman has been postponed until 2022. GFA decided to create an open online workshop called ‘The Future of Frankincense’ to gather those concerned to prioritise and coordinate current research needs, as well as to craft a roadmap of the most important and urgent activities. Over 300 people filled in the pre-workshop survey[4] and between 96 - 106 people attended each day.

[2] See Bongers et al (2019), DeCarlo et al (2020)
[3] FSNAU FAO & FEWS NET (2016)
[4] See Outcomes of the pre-workshop online survey

As mentioned above, the purpose of the on-line dialogue has been to prioritise what we need to know and do to support the long-term future of frankincense trees and the communities that harvest and depend on them. With over 100 people participating each day, it was agreed to keep a core of participants discussing in themed working groups. Each of the four themes, outlined below, had two break away groups who joined on the last day to collate their final prioritised lists. Parallel main room conversations focused first on the communities and secondly on conscious consumerism. While it was highlighted that the workshop was a great opportunity for networking, the main intended outcome of the workshop is a ROADMAP of the gaps in information, the actions we need to take and how we can take them.

The Theme and Breakout room leaders were:

1. **Theme 1: Botany identification & current status of the trees:** Professor Sebsebe Demissew, Dr Shahina Ghazanfar, Stephen Johnson.
2. **Theme 2: Communities, intentional propagation & forest management:** Professor Frans Bongers, Dr Anjanette de Carlo.
3. **Theme 3: Biochemistry and Medicinal Applications:** Professors Ahmed al-Harrasi and Abdul Latif Khan, Ahmed al-Rawahi.
4. **Theme 4: Supply chains, products, regulations and trade:** Professors Ben-Erik van Wyk and Tony Cunningham, Denzil Phillips.

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> *"Generally speaking there is not a clear understanding between local taxonomies versus western taxonomies. So obviously the western taxonomies are pretty dynamic as they are, new species are being described at the moment and if we keep doing field work and taking herbarium specimens I am sure we will find more and more species."*

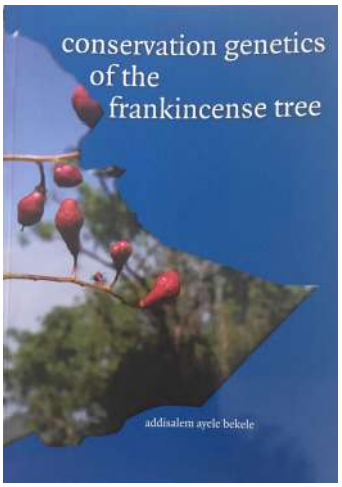
The Road Map

The most pressing gaps in knowledge and the actions identified in each theme are:

Theme 1: Botany, identification, and current status of the trees

GAP 1: How do we collectively gather adequate information on the current distribution and status of each of the Boswellia species populations?

ACTION 1: We need to fund and coordinate data collection on the current distribution and status of each of the Boswellia species population, (ages, structures and regeneration), the harvesting practices and pressures and how broader ecosystem issues of degradation, other threats and/ or climate change are affecting the status of each Boswellia species in their different populations and ranges. Multi-layered climate, soil and vegetation data can propose possible ranges of the different species. We then need to use strategic sampling and rapid qualitative and quantitative research, combining basic quantitative surveys with significant local integration/participation and focusing on local knowledge, in fully explained/consenting partnership with local communities. There is a need to develop functional tools that can be used by a combination of local university students and communities to assess the trees and yields. Range changes and shifts can be assessed from historical data, as well as a comprehensive inventory of where natural or intentional propagation and regeneration is happening.



GAP 2: How to have a central repository of information?

ACTION 2: Compile all the disparate information into an accessible location/ database so that there is a comprehensive and publicly available understanding of the current knowledge base, in order to identify what other information is urgently needed. Who can do this work? Who funds and coordinates it?

GAP 3: How to deeply understand how harvesters relate to the trees?

ACTION 3: There is an urgent importance of engaging further with the harvesting communities who actually manage the trees and understand how they perceive, engage with and manage the Boswellia trees. How do their local taxonomies, observations and cultural understandings of the trees and resins Interface with 'western' botanical taxonomies, research and understanding? How do these both, in turn, link up with the current perceived quality and value of each resin or essential oil product as it enters the current value chains? A lot of useful data by engaging with these groups as equal partners on the status and future of the different Boswellia populations.

GAP 4: How can the resin, essential oils and other products of each species be tracked back to specific species and woodlands?

ACTION 4: Understand and share how the different species, resins and essential oils are currently identified and develop tools to trace resins from their source and the specific resins and oils being harvested and traded. There is a need to develop tools to trace resins from their source into the global market. How can this be done and funded effectively? What specific markers should be looked at? What makes the most sense to be deployed? For instance, if the question is 'Can buyers or customs easily identify a resin or oil?'; What cost effective accessible tools and markers can be developed to differentiate and link resins and essential oils back to specific trees, populations and species?

> *"The other topic that came up again and again is exploring the options to add value and shortening the supply chain between communities and the market."*

Theme 2: Communities, regeneration (intentional propagation) and forest management.

COMMUNITIES

GAP 1: How we can make sure that local communities have a long-term involvement with the trees and resin and have a fair role and share in the long-term sustainable management and use?

ACTION 1a: We need to find out who are the owners and harvesters in each location? What are their harvesting practices and why? How they are currently organised and paid? How reliant are they on the resin harvest? What are their ownership and land use rights, their understanding of, connection to and long term relationship with the trees? Cooperatives are seen as the future, but beware of powerplays and rules and regulations. It may be questionable to take the past as a model for the present.

ACTION 1b: Cycle Assessments of resin. Follow the plants that produce the resins (how resin is made, how collected, how transported etc.). Evaluate ways to monitor this. Select good cases and detail what and why these are good cases (of forest management and local people involvement), across the whole range.

ACTION 1c: Education and training is needed at all levels, including at local and national government as well as company levels (e.g. Forest departments and their rules and regulations have immense impact)

ACTION 1d: Map per country the companies that get into the forest and use the forest, forest ownership, local regulations, any contestations on ownerships/use rights? Compile an overview of all the rules and regulations per species/country and the implications of these for the situation on the ground. (Forest level, species level. Regulatory taxes, concession rules and payments.

The need to develop a code of conduct for harvesters, buyers and producers (as in other value chains).

> *"Even within Ethiopia, there are 5, 6 or 7 different local forest management schemes for the same and different species; let alone the differences between range countries."*

ACTION 1e: Harvesters, cooperatives and communities need a fairer share of the overall profits. International buyers need to choose the responsible within-country companies to trade with and have checks and balances, as well as an ability to check out espoused practices. Third party voluntary certifications schemes are useful but can be expensive to maintain for small scale cooperatives and companies unless more value returns to them.

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FOREST AND TREE MANAGEMENT

GAP 2: How can we maintain forest and woodland health, and improve forest management and long-term sustainability and use? And how do we translate this into guidelines specific for species, countries and regions?

ACTION 2a: Engage in care for the present forests and woodlands. Develop ways to select areas to protect and set aside for regeneration, enrichment of standing forests and trees and to prevent conversion to other land uses.

ACTION 2b: Incentivise reforestation and plantation/enrichment planting/more species at the same time; i.e.: Combine any long-term plantations with enrichment of standing forests. All those involved along the value chain need to engage in community and forest management and maintenance, not only in profiting from the resin.

GAP 3: How to overcome challenges of large scale enrichment and/or propagation?

CHALLENGES TO ACTION 3: Frankincense trees can take 5-15 years to generate revenue. There are many technical genetic, biophysical, and agronomical issues to overcome with plantations as well as concerns that ex-situ or company owned plantations will not support investment in and empowerment of indigenous communities and forests.

ACTION 3: Compile available knowledge on plantation issues. Develop new experiments based on best practices, country and species specific. Develop comparative study across species and countries, which will lead to generalization for the genus. We need to care for current forests, ensure regeneration by set aside and prevent conversion to other land uses and combine any long-term plantations with enrichment of standing forests.

(NB: There is currently a focus on and funding for tree planting in semi - arid areas, especially in Africa. Investigate including endemic Boswellia (B.papyrifera /B.dalzielii) in the Green Wall Initiative).

Theme 3: Biochemistry and Medicinal Applications

GAP 1: How do we correct the misinformation about the bioactivity and uses of Frankincense as natural medicines?

ACTION 1a: Cancer, COVID and inflammation can usefully be key targets of specific boswellic acids and derivatives in vitro and vivo trials, as well as the synergistic effects of whole resin extracts of specific species. Safety pharmacology should be the key during such trials. When used for medicinal purposes, Frankincense resin products, the essential oils or other derivatives must go through pre or clinical trials/protocols to establish the bioactive chemical constituents and CMC (chemistry-manufacturer-control). The results of these trials needs to be followed up and taken through the country-specific regulatory pathways Medicinal properties should be understood from the basic to the end use product for a specific treatment.

> *“We are now talking about massively increased production of research based products and scientists are very concerned about the sustainability issue and it has to go in both directions A massive production of frankincense products <> Issue of sustainability.”*

ACTION 1b: Correct the misinformation about the bioactivity and uses of Frankincense as natural medicines. The group suggested that a non-technical report needs to be created and disseminated and spread to the public to create awareness of what has been scientifically technically proven and what has not.

GAP 2: How can we overcome the uncertainties created in the literature by using unvouchered samples and different libraries and techniques?

ACTION 2a: We need a joint research collaboration across community, scientists, government regulatory bodies and industries to carry out the basic chemical analysis of the resins and oils of multiple specimens of accurately sourced frankincense of each species is urgently needed. We need to fully understand the origin and source, as well as the biosynthetic pathways and genes responsible for producing the resins. This is urgent because while the resins and oils of each species can demonstrate some consistent terpenoid composition, the % of each constituent can vary considerably across different populations of the same species, probably due to genetic, environmental, seasonal, extraction and testing methodologies and protocols and other unknown factors. High throughput screening technology (HTS) may really help to identify the constituents and find key species specific markers. Building on this research we need essential oils research from basic constituents and compositions, to quantification, and dermal research, and to identify the kinds of boswellic acids that remain in the residual waste product after hydro-distillation oil extraction.

GAP 3: How can genomics assist in identifying species?

ACTION 3: Create international collaboration to find ways to gather the equivalent samples to do molecular and genomics analysis of each species to develop a dataset of sequences for broader taxonomy and population diversity across populations. Carry out more research on the chemistry of ignored frankincense species and their medicinal properties through in vivo and in vitro approaches.

GAP 4: What is the impact of climate change on Frankincense?

ACTION 4: Urgent research is needed on climate change impacts on chemistry and biochemistry, tree growth, harvesting, soil biology, microbial symbiosis and pathogenesis

GAP 5: How do we do this?

ACTION 5: Networking, Collaboration, Consortium: Establishing a consortium or collaboration of scientists (chemists, biologists, taxonomists), who can offer resources, expertise and time. How to fund such research?

> *"We do not want to get to the point where pseudo-science and misinformation is used to sell the product."*

Theme 4: Supply chains, products, regulations and trade

Overarching question: How can reliable, socially beneficial, ecologically sustainable & economically viable supply chains be developed that recognize diverse source species & production regions? *NB: Recognising very diverse uses (nationally) & diverse international markets (resin, essential oils, boswellic acids, fragrances).*

GAP 1: How can transparent, traceable supply chains be developed that deal with this diversity?

ACTION 1: Explore new technologies for tracing supply chains in a transparent way, to deal with adulteration, encourage sustainable harvest & raise awareness (business & consumers). NB: Block chain technology applied for years to food

markets, (Rejeb Et al 2020) more recently carbon markets & suggested for medicinal plants.... lots of hype & significant barriers. (Kouhizadeh et al., 2021) There are practical limitations in some countries. Adapt a variety of tracing systems, from pen & paper to bar codes, using smart phones. Traceability is essential to go to scale (& deal with adulteration & safety issues).

GAP 2: Where & under what circumstances is sustainable, commercial harvest possible?

There are good examples (e.g.: collection of naturally exuded resins in Somali region of Ethiopia and Northern Kenya) as well as examples of "what not to do" (Frans Bonger's team's work highlighting Boswellia declines in areas of Ethiopia, Eritrea & Sudan (Bongers et al 2019); Somaliland (De Carlo et al 2020), and Socotra (Lvoncik et al 2020). Research in Ethiopia suggests when owners & harvesters are different, it can have a negative impact on sustainability vs. community ownership (more chance of sustainable harvest). Active research and case studies on effective cooperative structures and producer associations (e.g.: as for baobab) can be initiated, supported and shared. Participants from Somalia and Somaliland pointed out how 30 years ago there were organised cooperatives, but that these have fallen away. Challenges now arise when big buyers prepay harvesters, then pay low prices, with the value addition of grading (which needs to adapt to market needs) & processing happening later.

> *"What came out and one of the big issues is the financial issue on how local people are part of the value chain and how finances, organisation, power very much determines their relative position in the field and their relative position towards the trees and the forest. What we realised is that this is so very different from one area to another one and one species to another."*

ACTION 2: Promote the good examples of how to add value within countries and within regions, where more is passed back down the supply chain by ethical traders. Educate and engage with creating a code of ethics for buyers and traders. The industry needs to develop sustainable supply chains through a combination of technological management plans that have widespread support & combine use of technology & "on the ground monitoring" at multiple scales that gets around the challenges of working in remote &/or often unstable areas. *NB: The multi-scale approach (LANDSAT mapping, monitoring resin yields, plot based inventories combined to understand potential yields for communities and harvesting cooperatives).*

GAP 3: Where & under what circumstances is cultivation possible at sufficient scale to supplement harvest from wild stocks?

ACTION 3: Collate lessons from Oman (B. sacra) and Jason Eslamieh's work in the USA (including hybrids) with the known challenges of growing other Burseraceae. Combine seed & seedling distribution & selection of farmer entrepreneurs with secure tenure over the trees, ideally, in regions with good governance, with policy support for "scaling out" production. NB: There are a range of models for successful "scaling out", including a "decentralized, incentivized" nursery model, where local people get viable seed from known species & there is a "buy back" system. This brings local income & avoids the costs of large, state run nurseries.

- Example: Selecting elite cuttings (based on chemistry) for nursery production. Care is needed with accurate seed sourcing.

Main Room Discussion 1: Conversation with Field experts on supporting the long term sustainability of the communities and trees.

Discussants: Abeje Eshete, Abdinasir Abdikadir, Muna Ismail, Mohed Jama, Isaiah Lekisike, Dan Reigler, Ed Barrow and Soumya Kori

GAP 1: How can we build upon local knowledge systems and local institutions to better improve land management?

ACTION 1: Listen and record how the communities manage their resources.

GAP 2: How do we get such local knowledge systems and institutional arrangements respected and recognised by government?

ACTION 2: Gather information not only on the current local, regional and national regulations but also on how they are implemented. Taxes that are raised and assess how they can in practice, best create an optimal enabling environment for value addition at source. Improve the capacities of the forest officers in frankincense areas, on the technical aspects (silviculture, production and management, marketing, etc.) of frankincense trees, for better supervision and following up.

GAP 3: How do we formalize existing local knowledge and institutions in a broad way that will improve management of frankincense trees and forests; embracing tapping, replanting, regeneration and a whole range of relevant issues?

ACTION 3: Capture, formalise and implement local knowledge in such a way that:

1. It will support livelihoods and communities are not being exploited,
2. Communities can defend their rights locally to the elders and nationally to the government.
3. There are supportive policies in place that will support sustainable frankincense harvesting and all the training needed, and equally importantly, the value chains from the farmers/ pastoralists all the way to the final retail marketer.

> *"As long as the harvesters only sell raw material and are not involved in the value-added chain, they will always make the lowest cut of the final profit."*

GAP 4: How much can a harvester earn in a day?

ACTION 4: Determine how long it takes to sustainably collect 1 kg of resin in the different species, regions and seasons. Determine whether the focus is on quality or quantity, as well as the pricing structures and market fluctuations.

Main room Discussion 2: Conversation on being a conscious consumer:

Discussants: David Crow, Bert-Jan Ottens, Dan Reigler, Kelly Ablard and Shebhaz Khan

GAP 1: How many young people still know the 'sourcing and inner' aspects of these products, beyond the ingredients?

ACTION 1: Use the retail opportunity to educate and create an emotional and spiritual connection with the young consumer demanding more transparency, connection and sustainability. Use technologies to bring nature closer.

GAP 2: If we seek to deepen consumer understanding, what does consumer education mean?

ACTION 2: There are fewer suppliers that retail customers. Seek to change suppliers focus from lowest price to quality, fairly sourced value chains, species and/or batch specific purchasing and educate consumers on the long-term value of paying a slightly higher price for transparency and sustainability. Work with private companies to create a handbook and conscious consumer campaign that explains the current realities and can act as a basis for raising consumer awareness.

GAP 3: How do those taking the trouble to do it right, such as many diaspora or those working directly with the communities, get recognised, rewarded and differentiated from those who do not?

ACTION 3: Explore mechanisms to celebrate those doing it right and adding value at source and to give those looking to purchase 'ethical' frankincense the means to do so.

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Additional Actions

1. Continue with workshops/conferences as the potential exists for even more information to be collected and assimilated, so we have a better birds eye view of all the different species different issues, through more virtual conferences.

2. Use questionnaires & templates to conduct a survey (via email) to record same information as above; We can have many people contributing and it is a cost effective and efficient way to gather information on the industry. Also online workshops or conferences, with carefully selected participants from all producing regions/countries.

3. Take the 'Gaps & Actions' from this workshop forward through sub-committees with specific tasks, define the themes and see if we can generate any useful cross-regional comparisons. The results can be a Proceedings or Trade Brochure that would talk to all the different role players to disseminate information about: (a) supply chains & how they differ; (b) The different types of raw materials & products that are available; c) a survey of all potential regulations & interventions that can contribute to sustainable use & community empowerment. Currently small companies wanting to know where to buy ethical frankincense do not know how to go about selecting ethical suppliers. They want to contribute to ethical trade but do not have the necessary information.

> *"The group suggested that a non-technical report needs to be created and disseminated and spread to the public to create awareness of what has been scientifically technically proven and what has not."*

In summary: the top actions needed are:

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1. Create a consortium of local and international scientists and decide sub groups and leads to establish:-
    1. The status, range, health, regeneration, challenges and threats for each species
    2. The physical, chemical, specific markers and current uses of the resins and resin products of each species, matching local taxonomies with western nomenclature and internationally traded products.
    3. The socio-economic realities of each of the communities that own and harvest the trees and to identify what will most incentivize their engagement in the long term sustainability of the trees.
    4. The current trade volumes, patterns and how new technologies can support transparency and traceability.
    5. Which trade and other certification programmes and local, national and international regulations will most support the long term health of the trees and communities that manage and harvest them.
2. Initiate, record and share the results of active 'best practice' pilot projects for both the trees and communities in key harvesting areas
3. Create an accessible handbook on the current established medicinal and aromatic properties of each species
4. Work with private companies to create a handbook and conscious consumer campaign that explains the current realities and can act as a basis for raising consumer awareness.
5. Seek out how to collaborate with existing projects and generate proposals of large scale third party funding. Short-term actions (yr1-2): Mid-term actions (yr2-5): Long-term actions (yr5-10).

Follow up actions:

- GFA will send this short report out to all participants and make all the workshop outputs available on the website www.globalfrankincensealliance.com
- GFA invite members to form collaborative working groups

References

Bongers F. et al. (2019) Frankincense in Peril. Nature Sustainability. DOI: 10.1038/s41893-019-0322-2

DeCarlo A., Saleem A., et al (2020) 'Ecological and Economic Sustainability of Non-Timber Forest Products in Post–Conflict Recovery: A Case Study of the Frankincense (Boswellia spp) Resin Harvesting in Somaliland (Somalia) Vol. 12 (9) p. 3578.

FSNAU FAO & FEWS NET (2016) Somalia Livelihood Profiles: East Golis Frankincense, Goats and Fishing (Zone S007) Pg. 91- 102 June

Kouhizadeh M.et al., (2021) Blockchain technology and sustainable supply chains: Theoretically exploring adoption barriers. International Journal of Production Economics Vol. 231 Issue C

Lvončík S., Vahalik P. et al (2020) Development of a population of Boswellia elongata Balf. F. in Homhil nature sanctuary, Socotra Island (Yemen). Rendiconti Lincei. Scienze Fischie e Naturali 31: 747-759

Rejeb A., et al (2020) Blockchain and supply chain sustainability LogForum 16 (3) Pg 363-372

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The Future of Frankincense online Workshop Proceedings

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Monday 15th March 1-4pm GMT

As described in the road map, the purpose of the workshop has been to prioritise what we need to know and do to support the long term future of frankincense trees and the communities that harvest and depend on them.

Outcomes:

Other issues included:

- A prioritized list of questions that need answering and actions that can be taken in each of the four themes
- Raised awareness about the very different context of the different species
- An awareness of who else is interested and working with frankincense and an opportunity to network during and after the workshop

While the roadmap picked out the most cogent gaps and actions, these proceedings serve to give additional detail of the discussions that took place.

After a welcome and introduction from Denzil Phillips, a GFA interim coordinator, the participants randomly met in pairs to meet and greet. Sue Canney Davison, the main facilitator, shared the purpose, processes and desired outcomes of the workshop. She emphasized the need to keep the frankincense trees and the communities who manage and harvest them at the centre of all the discussion and set principles of participation.

Anjanette deCarlo then introduced key scientists whom she had organized to conduct focal groups with communities, harvesters, traders and researchers. These included Muna Ismail and Mohed Jama representing 7 families in Somaliland, Abeje Eshete, Abdinasir Abdikadir and Yeshimebet Tegenie in different regions of Ethiopia, Isaiah Lekisike in Samburu County Kenya and Maia Willson of the Environmental Society of Oman. Dr deCarlo explained that the methodology was an open-ended narrative process where the focus group country facilitators posed open-ended questions allowing the community participants to respond freely without leading them. The two main questions posed were:

1. **What are the problems?,**
2. **What are the solutions?**

Another reason for conducting the focus groups has been to create a bridge between the people in the harvesting and sorting communities whose voice and realities are seldom represented or reported, who do not speak English, who do not have internet access, and are seldom able to join larger meetings.

The harvesters reported low unstable income, lack of regulated ownership, harvesting or working conditions, lack of safety and PPE equipment, access to food, water, healthcare, education, training or reliable secure markets. They are also clear on the solutions for which they need support from all the stakeholders .

The discussion on community owned and managed forests and harvesting continued in the main room. Key speakers were: Abeje Eshete, Solomon Mengesha, Mohed Jama, Isaiah Lekisike, Soumaya Kori, Ed Barrow, Dan Riegler. Highlights of that discussion and comments in the chat are:

COMMUNITY FOREST OWNERSHIP AND MANAGEMENT

Gaps and questions

GAP: How can we build upon local knowledge systems and local institutions to better improve land management?'

ACTION: Go, listen and record how the communities manage their resources'

'The ideas for solutions are very simple. How do we learn from and build on the indigenous knowledge base of how to manage incense trees or trees in general? I learnt a long time ago, working with pastoralists in Northern Kenya when I started talking about range management they said, '…come and listen and see how we manage our resources'. How can we build upon local knowledge systems and local institutions to better improve land management?' 'The other part of it is how do we get such knowledge systems and institutional arrangements respected and recognised by government? We heard of participatory forest management in Ethiopia, the law and policy is very supportive, as it is in Kenya. But when you come to implementation the forestry authorities can put in place so many barriers to communities being able to own and manage their own forests.' 'Can we think of forest gardens?'

'How do we learn from existing frankincense tree growing and the institutions and knowledge behind that? How do we formalise that in a strong way so that:-

1. It will support livelihoods, so that communities are not being exploited, we have had many examples of where they are being exploited and may continue to be exploited.

2. They can defend their rights locally to the elders and nationally to the government.

3. 'There are supportive policies in place that will support sustainable frankincense harvesting and all the training needed, but equally important the value chains from the farmers/ pastoralists all the way to the final retail marketer'.

'Many value chains are top heavy and they benefit the end marketer and do not benefit rural people and pastoralists. Many are talking about improving tapping as an important issue. Can we embed that in a much broader approach of 'How do we improve management of frankincense trees and forests which would embrace tapping, replanting, regeneration and a whole range of things?'.

[1] A table of the main focus group points by country can be found in Additional Information 1: at the end of this report.

Somalia/ Somaliland

'In the Sanaag, in Somaliland, harvesting has been a man's job, partly because the trees are tall and in remote dangerous areas. Women are vital in the industry for sorting, grading and using the resin, as well as reliable, trustworthy and dependable. Each family owns 40 km2 which is passed down through 15/20 generations in hereditary traditions in tribal areas. There are traditional ancient sorting songs and poems which tell of where people used to sell the products for big money to China, Chechnya, Russia, even Iran. Before the war (in 1993), there were basic rules and regulations from the owner, the harvester, the sorting and storage to the salesman. The Somalilanders and Somalis have thousands of years of indigenous knowledge and they have their own tools. They are well known internationally to have deep harvesting experience. The problem is when people start renting their trees'.

'After the war, for the last 30 years there are now no rules and regulations and people with the knowledge of tree management and harvesting left the area. Whoever is staying now in the extended families, they rent it out to other people and the people harvesting do not have the traditional knowledge. A trader comes in, they take money from external finance and they go and harvest the trees. They cut the trees and collect the resin after 2/3 months. Some produce twice and some once a year. There has been a lot of demand and other Somalians are coming in acting as a middle-men, taking all the gums and mixing the different grades. They do not know how to differentiate. The trees are being destroyed and are dying. But this year they refused to rent or cut them. In terms of water for the trees, it depends on the rain. In Somaliland not a lot of animals can reach the branches and only humans can damage the trees'.

'Only four 'families' own Boswellia frereana areas'. People left and they only rent it very cheaply and they do not have a market. The clan families are losing their cultural and traditional roots and knowledge of what kind of tree, how it grows, where to sell it. They just want money. It is completely different from Ethiopia, Kenya and Oman'.

The Boswellia trees are in a very beautiful forest in the Sanaag region that is very scenic and could be a very strong base for nature based eco-tourism. The infrastructure needs to be developed and the perception of insecurity needs to disappear.

'Somalians do not need someone to come and teach them how to harvest trees, we know how to harvest and look after these trees. The different areas have different traditions. In Puntland, Somaliland, people look after the trees, it is unrealistic to say that there is over harvesting. No one will allow you to overtap the trees. If you go to the areas in Somalia where there is no control, then they may be being cut and myrrh trees in areas, like Beledwayne, may be overharvested. But even then, in the last seven years, people are waking up as a kilo of myrrh has gone from 1 -2$ Kg and to 15$. So what is the solution? We do not need people to come and tell us how to harvest, we need access to ethical and reliable international buyers and markets.

[2] It has been reported that 12 sub-clans own most of the land on which B.sacra & some say 2 clan families own B. frereana grows in the Sanaag region of Somaliland. Emphasising the need for much greater understanding of ownership, access and use rights, particularly as some ownership claims have been weakened by the fact that conflict has driven traditional owners away from the areas for up to 30 years, often as expatriates living outside the Horn of Africa.

Ethiopia

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'In Ethiopia, we have different participatory forest management systems between the highlands and lowlands, and between government owned and participatory forest management owned by community who can then benefit directly. Production of frankincense in Ethiopia starts from October and ends in June, it requires continuous tapping every one/two weeks. Many recruitments of young trees have been seen in less disturbed areas of Ethiopia.

In Metema, because the law is not allowing the agricultural farmers to hire skilled labour and it is labour intensive, the farmers are not interested or used to it. Ethiopia is now exporting very little compared to before. We need to allow skilled labour tappers under the supervision of the local community which could be a fairer system'.

THE SOMALI REGION OF ETHIOPIA

It is not known if B. neglecta and B.rivae (and B.microphylla) are usefully tapped. Currently resin is produced in response to passing camel, cattle and goat pressure and damage. Currently communities make no interventions on the trees, they wait for the tears to form and then collect them, often from the ground. They do not believe there is no tapping system, so trials and research is needed.

'Regarding the Somali region of Ethiopia, a land/tree tenure system needs to be set up to prioritise a tenure/use rights system for the cooperatives. Currently the trees belong to all, as it is a traditional extended pastoralist ownership system. We need to have a group of cooperatives who manage the resin trees and rangeland by law. We need to control the system to prevent the destruction of the forest and additional systems; to close observation areas for regeneration; compare grazing and non-grazing areas and create a nursery with water collection to regenerate and replant. The harvesters need training on to how to collect high quality resin. They need to be connected to a laboratory to create the quality for export for pharmaceutical uses. While tapping, harvesting and selling is relatively straightforward, conservation is very complex and brings in multiple factors and has to be very intentional'.

'There are lots of challenges to setting up cooperatives. There is a lot of very dense forest in our region and establishing a cooperative can give people a lot of opportunity to use and utilise the resins to improve their livelihood. Over the last 2 years, we have established 20 cooperatives for local harvesters and 20 cooperatives for taking the local yield and making market chain linkages; a total of 40 cooperatives for research purposes. Training was completed and a tapping and harvesting system demonstrated which is not being adopted and was discontinued because of low institutional capacity. Still, people are encouraged and eager to have licensed cooperatives in the region as importantly, local and government interventions make people aware that these tree have value for them and that over harvesting and cutting the actual trees can unsustainably reduce the forests. Establishing a cooperative is more important for making separate areas so that they can utilise'.

'Gender. We already bridged the gap of gender inequality. There was a problem with men dominating the power of the women. We already encouraged the women in the area to participate in harvesting. We diminished the number of male cooperatives and increased the number of women involved. There is a bridge we need to solve first for women to keep the money and prioritise women's wellness in fluctuating harsh conditions and create a stable income. We need more capacity building for them and more financial support to keep them encouraged'

TECHNICAL AND ACTIVITY RELATED COMMENTS

- Deterioration of frankincense woodlands in Sudan due to improper tapping (over tapping or too much tapping wounds), overgrazing, illicit felling and fires.
- Lack of motivation for the local people to participate in production. In many areas the local people are not involved in frankincense production, so how to encourage and motivate them to practice frankincense production is one of the important issues, especially in Sudan.
- A lot of fees and taxes charged by different governmental departments and the local leaders
- Poor intervention of the government (lack of good governance)
- Lack of awareness about the value and importance frankincense trees for most of the people in Darfur
- Absence of initiatives or organizations that can play a role in sustainable management and production of frankincense in Sudan

PROPOSED SOLUTIONS

- Improvement of the capacities of the forest officers in frankincense areas, on the technical aspects (silviculture, production and management, marketing, etc.) of frankincense trees, for better supervision and following up.
- Awareness raising, training on production and marketing for the local people living in frankincense areas, to encourage and motivate them to participate in frankincense production effectively.
- Coordination between the different government sectors or departments themselves and between the local leaders, who are charging taxes and fees, not to burden the frankincense producers
- The government of Sudan should put more effort on frankincense management, like gum arabic, so that it can contribute to the economy of the country.
- Intervention of the national and international organizations, which deal with environmental conservations and natural resources management for the livelihoods, by considering frankincense trees in their project priorities in Sudan.

India

'Frankincense and non-timber forest products are often treated as a holy sacred item as in Somaliland. There is a lack of awareness,skills, tools and knowledge of the best harvesting practice and patterns. Harvests and quality are unpredictable with little institutional support. In Karnataka in the southern part of the Western Ghats in the southern part of India, it is harvested only for religious purposes and sold in temple markets. In this area, overharvesting is less of a problem than invasive species such as lantana. Harvesting is being regulated in other parts of India'.

WHAT A HARVESTER CAN EARN IN A DAY OR A SEASON?

A discussion arose in the chat:

- How long does it take for a harvester to collect 1 kg of frankincense?
- Responses included: It takes anywhere between 1-6 hrs. to collect 1 kg of gum depending on the concentration of the trees. It can take up to several weeks to collect 1kg, depending on the quality you target as you need to wait till it is collectable and not sticky any more. That means about 3 to 16 dollars per day.
- If it takes several weeks for 1 kg, then the people are earning far below minimum wage, even by South African standards. Maybe it will be better to pay the harvesters more money, rather than to treat them as destitute people in need of charity?
- The yield per tapping round increases as the season goes on, so it is perhaps more useful to look at total yield at the end of the season and the full length of the season to work out the dollars per hour or per day rate. Also keep in mind the answer will be different for each species and ecosystem since it depends on the density of the trees, the harvesting type (tapped or not), etc.
- What is the basis for payment for labourers? By the hour or by kg? How do they determine classification of quality? In many (most?) cases payment is per quantity (weight), combined with a small check on stones etc.

ADDING VALUE AT SOURCE

'We could learn from the womens Argan oil cooperatives in Morocco making small independent businesses and selling the products to the tourists. We cannot introduce western culture into the different cultures. Diaspora can create cooperatives for women as they can bridge the cultures'

CLIMATE CHANGE

'How do the communities and stakeholders in producing regions see the impact of climate change impact on sustainability of the supply chain from both the crucial life threatening point of view as well as frankincense subsistence farming?'

Frankincense grows in very dry areas. Dry conditions are going to be more common and more extreme, maybe more frequent. Not sure what effect that will have on the silviculture of Boswellia trees that do not need much water, but likely to have some impact.

For some concerned artists and craftsmen going to the source of the product is important, wanting to go right to the root, to create quality and in going to source in Ethiopia and Kenya it was obvious there were issues with the trees and the harvesters

Note: Reports are that some B. papyrifera trees in Sudan have regenerated in war zones, the cyclones in Oman led to greater B. sacra sapling growth and the many trees in Somaliland have been rested during COVID times and people's attention rather turning to gold.

Wednesday March 17th 2021

Main room discussion on being a conscious consumer

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This was a very general discussion sharing a lot of the speakers' experiences and approaches and has been summarised into some key points around a main question of 'How can we become more engaged and educated as consumers?"

GENERATIONAL DIFFERENCES?

'How many young people still know the 'sourcing and inner' aspects of these products, beyond the ingredients? If we seek to deepen consumer understanding, what does consumer education mean? 'Conscious capitalism is on the rise. The younger generation is increasingly demanding transparency. There is a big opportunity to educate and create an emotional connection with consumers.

Can we use technologies to bring nature closer to the consumer? Currently low-cost sourcing is part of the problem. The price should reflect the quality and may mean less supply. The shift needs to happen with retailers and consumers. Educating them and creating the emotional connection will yield the higher price that is needed. I believe the younger generation are a collective force to drive responsible consumption. As long as the harvesters only sell raw material and are not involved in the value-added chain, they will always make the lowest cut of the final profit.

FINDING THE ETHICAL BUYERS WHO BUY FROM SOURCE.

'There are two types of 'consumers' who need to be 'conscious', those that buy directly from the harvesters and the customers who buy the final retail product'. Two speakers, Shebhaz Kahn and Dan Riegler have gone to the trees in Oman, Ethiopia and Kenya respectively and buy directly from the harvesters themselves. For them, not only is it about establishing an understanding of and connection to the source, but also about establishing a fair and respectful relationship to the harvesters, and as small scale retailers and craftsmen, ensuring very high quality.

SELLING THE RESIN AND OIL AS MORE THAN JUST A COMMODITY.

'This approach not only respects the very different medicinal, aromatic and experiential properties of the resins and oils of the different Boswellia species from very different areas, but also allows a unique batch approach to the seasonal and population variances within one species. If this approach is elevated to the level of products from specific tree populations and farms with artisanal distillation, it can create and ensure a very high quality 'vintage' approach to each limited edition oil batch.

The question still remains, 'will educated consumers understand and appreciate the value of this approach?' An approach where spiritual, cultural, environmental and fair socio-economic connections are maintained, 'contained' within the product and pay the extra cost incurred? Are they willing to invest in distinguishing this approach from 100's of tons of raw resin being exported at one time through bulk traders for large scale essential oil distillation and species blending by some international companies?'

‘Until now we have been focusing on quantity, how much can I get and how little is it going to cost and so we buy things at the cheapest price to sell them at the highest price to maximize on profit. The economics has been based on profit and quantity rather than quality and I think that needs to change as well as the discussion on value added. There are far fewer suppliers than retail consumers, so we need to focus on them and how do we hold them accountable? There are really sustainable, mindful, conscious and respectful ways of doing this that comes with value added. There must be a demand for this value added which to some degree translates to higher quality. Exceedingly difficult to educate all of the consumers to ask them the many questions that we are dealing with with frankincense today; the difference species, the different eco systems, the different tapping methods, the different pressures and needs of the communities. But this is where change will come from.’

- How do those taking the trouble to do it right, such as many diaspora or those working directly with the communities, get recognised, rewarded and differentiated from those who do not?
- Can the diaspora play a much bigger role in adding value at source?

Organic has little meaning as these are almost all wild-harvested trees. Third party voluntary certifications schemes, as opposed to self-certified schemes, such as EcoCert, FairWild can assist, yet can be very expensive to implement and upkeep for the small scale producer and needs to be off set against customers willing to pay a higher price. It is not only a consumer validation that we as retailers can commercialize, but could it also be used to establish the trade requirements around equipment and wages?

Many questions were raised with limited time to generate answers and solutions.

- How can a consumer find out what is actually happening at source beyond what companies espouse and write on their websites?
- Can sustainable, ethical and transparent sourcing from the trees themselves and artisanal distilling reach as large a scale at affordable prices as any other less careful bulk harvesting and bulk distilling approaches currently employed?
- Does ‘ethical’ and ‘good’ necessarily mean smaller scale and more costly?
- Does paying $60 rather than 10$ for a 10ml bottle currently ensure sustainable harvesting and equitable share for the communities?
- How can digital technology and apps educate and engage the youth and be used to assist in making supply chains more transparent and raise awareness?
- How can conscious consumers currently best find ethically sourced resins and oils?

MANAGING THE BRIDGE BETWEEN TRADITIONAL AND SCIENTIFICALLY VERIFIED MEDICINAL PROPERTIES

‘There is the huge amount of research coming out all the time and this can be found in the scientific medical basis, specific compounds can be researched both individually and integrally. There are some human clinical trials as well as in vivo and vitro. There is a natural misconception about natural medicine being

‘ pseudo-science’ that is starting to clear up. It used to be a major argument that there was no evidence that this works, despite thousands of years and centuries at least of application of all kinds of medicinal species and case based evidence. Now modern scientific research is catching up and is confirming and proving what people have known, finding the biochemical mechanisms and making a lot of very new discoveries as well, both in terms of how botanical medicine works and new methods of administration. Frankincense is a species that is getting a lot of attention in the scientific medical research community and is being explored for its benefits against inflammation, microbes, cancer and for enhancing the immune system. It represents a tremendous medical, pharmaceutical resource in addition to the traditional way of using it’.

This discussion raised many questions, demonstrating the need to identify the impact of education and awareness campaigns on the customers willingness to demand, seek out and pay for transparent, fair and ethical sourcing. What do they need to know? What questions can they ask? What should they look for?

More detailed feedback from 8 themed breakout rooms

Theme 1 Botany identification & current status of the trees Breakout room leaders: Professor Sebsebe Demissew, Dr Shahina Ghazanfar, Stephen Johnson.

WHAT DO WE NEED TO KNOW?

- Further rapid qualitative and quantitative research, combining basic quantitative surveys with significant local integration/participation and focusing on local knowledge, in fully explained/consenting partnership with local communities. There needs to be clear communication and integration so that local communities are full partners in the research, not subjects being examined. Large, in-depth quantitative surveys, like have been done in Ethiopia are impractical on any scale, so surveys should focus on strategic sampling, integrating local ecological knowledge and protocols that local people can effectively implement.
- It would be useful to have a strong comparative study between species, to understand where commonalities or differences are, and therefore to what degree we can extrapolate from existing research
- Six Boswellia species occur in Ethiopia, with additional ones in the Horn of Africa. Taxonomy is relatively clear and B.papyrifera trees, resin and oil identification is clear cut. But in the Somali region of Ethiopia, local names are confusing, Boswellia and Commiphora resins get mixed up, (such as B.neglecta and C.confusa) are sometimes the same colour and expertise is needed to identify the trees. We need to integrate local and Western taxonomies and better understand how local ecological knowledge relates to “Western scientific” understanding. A major point in taxonomy is what we plan to use it for--whether we’re using a (fairly dynamic) Western taxonomy or a local taxonomy, how we talk about the trees depends on what questions we’re asking.

> *“If we are talking about systematic sampling ALL Boswellia species for identification or ther research then we need to address Access & Benefit Sharing mechanisms directly.”*

- The existing documented flora and fauna of Ethiopia, Somali and East Africa do not align, especially with regard to Commiphora and young scientists need to develop the expertise in taxonomy and identification to assure a higher quality and consistent product for the market in particular for medicinal and pharmacological authenticity. Better understanding of markers to identify 1) products like resins and match to the source trees, and 2) identify biological species to avoid hybridizing during reforestation efforts
- Along with accurate botany we need to address the socio-economic and environmental issues. We discussed the different species in Somaliland in in Oman. If we really want to have a sustainable Boswellia and Commiphora market, we need to protect trees in situ and unless we help communities to protect these trees, the trees do not have a future. The communities need to be able to conserve the woodland wherever they are. The resins are important we need to have the mother and to have the mother we need to protect the landscape so it is the vegetation and the species and that will really benefit the communities.

WHAT WE NEED TO DO?

1. Species need to be clearly identified, especially those in mixed forests like B. rivae, B. neglecta, B. microphylla. B ogandensis. Clear ID. of species, look alikes, and ability to use simple markers to distinguish between species, even for non-experts. Species need to be treated as separate entities, don't assume that they will be comparable to each other. Develop clear methods to link the product (resins) to species and taxonomies.
2. Need to map where species are and what the status is--can be fine-scale in places like Socotra, but perhaps broad-scale for species like B. dalzielii, B. sacra, etc. To do a tree population inventory (and follow it during the following years). Local surveys are difficult, as it can involve people that are not really trained for that. So why not include the students from universities. It can be part of botanical education to do local surveys; to get data on the age, habits, habitat of the trees. Involve the local harvesters to assess which trees produce more, which trees less. Can we develop some sort of scientific criteria that can be applied say 1 hour or 2 hours a one day to assess how much is actually harvested? How do we get the best results in time?
3. Significant further engagement with local communities and people who directly manage and live with the trees. Using this engagement and partnership, focus on aligning taxonomies, understanding drivers of threats (why is overharvesting occurring, further research on insects, etc), and broadly surveying the current status and range of species (particularly those in trade). Ensure that tangible benefits go to harvesters/communities/direct managers so that they see conservation-oriented actions as being the most directly beneficial course of action. Harvesters need market conditions that support them better and incentivize sustainability
4. Impact of climate change on the future of trees - scientific study

Theme 2 Communities, intentional propagation & forest management. Breakout room leaders: Professor Frans Bongers, Dr Anjanette DeCarlo

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WHAT WE NEED TO KNOW

- The habits and habitat of the trees which can grow in semi-arid areas and in some places in very dry and hot areas (e.g. Afar in Ethiopia). We need to know much better where species are growing, where they are regenerating, and where they are vanishing (e.g. by conversion).
- Distribution: The question is where, what, how much, and what are the bottlenecks?
- Identify and quantify the threats e.g. grazing, forest fire, forest conversion (populations declined in size, fragmented, over-tapping, insect attacks and pathogenesis.
- Understanding the impact that ownership, financial issues, fair sharing, stable markets and prices has on incentivizing sustainability. Can a healthy connection between the communities, harvesters and the trees solve many issues of overharvesting? Living forests need to be seen as valuable.
- Overall pricing issues and transparency issues. Find out how this is different across species and countries and even regions.
- What kind of value addition and production is commercially viable in each country?
- Forest Management: We need more data on forest density and regeneration rates. What is possible with intentional propagation which is not a solution to over harvesting.
- A technical question that arose in the chat included In the wild, do frankincense seeds germinate all at once in a group or singularly apart from each other?

WHAT WE NEED TO DO?

- Assess property and use rights (clan, private, government, communal).
- Assess local rules and laws/regulations, how they are implemented and how effective they are in specific situations (incl bottlenecks).
- Assess alternative practices. Implement best practices?
- Assess equity/fairness, alternative means of income. Implement best practices?
- Develop training and guidelines on how to improve. Engage, engage, engage.
- Co-design resource assessment schemes with locals (Kenya, and other areas)
- Forest management
- Establish forest reserve areas for conservation, in close arrangement with local people
- Establish small scale/ farm level tree preservation, planting, agroforestry
- Assess regeneration/propagation issues and bottlenecks (e.g. livestock, fire; different for species and areas) and act to solve them (enclosures, fire breaks, no free grazing, out planting with care and monitoring)
- Assess lopping/tapping interactions (which have devastating effects on yield and insect infestation)

> *“The key is to prevent the ‘cartels’ from controlling the supply chain. Harvesters can be trained not just to sort product but to create value added products from incense to medicine to oils/ hydrosols. Creating medicine that they can use in their own communities is one of the key things and that has been hugely successful in other projects.”*

- Assess effectiveness of Participatory Forest Management schemes and design more effective alternatives.
- Develop schemes with less focus on Boswellia and more on ecosystem functions and services (water catching, soil retention, diverse use and diverse products, ecotourism? And sell the broad package for forest maintenance incl. Boswellia)
- Reduce conversion to alternative land use by focus on ALL ecosystem services of a forest.
- Experiment with parklands creating more domestication then only in the wild but not full plantations and allowing further investigation on the growth and resin of intentionally planted frankincense trees, versus wild trees.

ADDITIONAL ISSUES

- Avoid middle men in order that money comes directly to the communities, increasing local upgrading.
- Improve infrastructure (as women and men have to walk a lot to collect gum from trees from remote areas)
- Increase the wellbeing of women sorting (tables, masks, gloves, ventilation)
- Provide tapping training for everyone (to get skilled collectors)
- Invest in long term connections to provide security of income.
- Ecosystem function of trees and forests. This is also important for external people. (villages, cities, country). The value of forest is much higher than only Boswellia resin (PES, resin, other things, water, soil retention). Other NTFP's such as honey
- Concentrate on some areas for better management?
- What can we learn and translate from the good examples to the less good ones?
- Need access to seeds to study regeneration. Researchers seeing low seed germination, Practitioners seeing higher germination than researchers. Study mixed plantings, not just mono cropping Boswellia.
- Need to study how to plant the seedlings back into forest with success.
- Explore options to add value and shorten the supply chain.
- Change the grading systems to match the current market demands and realities. Outdated grading is problematic.
- Education is key. Educating general public in country and internationally on the value of trees and frankincense
- Maintain the traditional lifestyle, it is not only about increased pay. Understand the local culture
- Need proper frankincense institution to centrally work on frankincense. Policy and implementation is fragmented. Production companies may not have the resources and need international support.

> *"How can we match people who want to "help" with communities who need it to start to solve/improve some of the issues?"*

IN SUMMARY:

Develop a knowledge project

- Compile an overview of all the rules and regulations per species /country and the implications of these for the situation on the ground. (Forest level, species level. Regulatory taxes, concession rules and payments.
- Cycle assessments of resin. Follow the plants that produce the resins (how resin made, how collected, how transported etc.). Evaluate ways to monitor this.
- Select good cases and detail what and why these are good cases (of forest management and local people involvement), across the whole range.
- Map per country the companies that get into the forest and use the forest, forest ownership, local regulations, any contestations on ownerships/use rights?
- Compile available knowledge on plantation issues; Develop new experiments based on best practices, country and species specific.
- Develop comparative study across species and countries, to understand what are common issues and what are different across species.

Develop implementation projects

- Select "good" companies and support them as much as we can. Buy their products. Copy the system and implement in other areas
- Select highly producing trees for seed and cutting selection? Domestication and breeding.
- Develop seedling and cutting stocks for out planting.
- Develop larger experimental plantations with every year new experiments added, to be able to cover also for climate events
- Identify the benefits and challenges of private mono-plantations, creating nurseries and replanting in existing forests, or conserving existing woodlands without harvesting.
- Develop best practice system across cultures, but within species.
- Develop tapping/collection techniques that are suitable per species. One-time tapping for longer period instead of reopening wounds?
- Develop tapping incentives based on quality of tree treatment. Less tapping with better tree treatment will pay better than alternatives.
- Develop ways to select areas for fully setting aside for long term protection of trees/forests and genetic resource.
- Develop ways to keep product separated and location bound (tracing to farm, or tree etc).
- Calculate extra costs.

> *"Supporting the power of the dispora to create a bridge to international consumers and add value in their original communities"*

Theme 3 Biochemistry and Medicinal Applications Breakout room leaders: Professor Ahmed al Harrasi, Professor Abdul Latif Khan, Ahmed al Rawahi.

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WHAT WE NEED TO KNOW

- What are gene regulatory network in frankincense production?
- How to improve healing and recovery wound process of the tree for next tapping cycle?
- Clinical process of active extract
- The importance of the other 16 species of Boswellia for chemistry
- Researches and uses with Alzheimer disease
- Environmental impact and recovery process of the trees; Cost and safety of the chemical product from frankincense ;
- There is need for more evidence based research; Total synthesis vs natural isolated compounds from Boswellia;
- Careful about claims about frankincense for its medicinal uses; Clinical studies needed
- Intellectual properties;
- DNA barcoding
- Seed banks
- Gene sequencing
- Cell culture strategies to grow in lab - frankincense tissue
- Seed banks to add up to conservation and preservation
- Hybridization through horticulture approaches could improve species fitness
- Synthetics vs non-synthetics (thinking about quality and sustainability)
- Correcting the mis-information about the bioactivity and uses of frankincense as natural medicines.
- Clinical trials need to be done to further investigate the boswellic acids as anticancer! (initiative)
- The boswellic acids have been scientifically approved as a superior anti-inflammatory drug. (clinical trials ongoing internationally)
- Nutraceuticals products are available and used to treat/prevent various diseases. (this will accelerate the process of approval)
- A massive production of frankincense products <> Issue of sustainability.
  - HTS will help in discovering more compounds with high potential.

A note on developing quality standards: The aloe industry in South Africa developed a National Standard for aloe raw materials - by not making value judgements (some people have specific uses for low quality grades) but rather by accurately describing the levels of main compounds - then the buyers can decide for themselves what to buy. What constitutes high quality may often be different for different buyers since it all depends on each buyer's/consumer's needs and uses

> *"Blockchain is a must when it comes to transparency in combination with geomapping... Traceability, sustainability, harvest status - all these points could be measurably included here."*

WHAT WE NEED TO DO

- Adulteration in frankincense and its oil in grades, chemical composition and cross contamination from among species. Supply of samples from all species to create a map or profile of each species. This will help in organic certification and barcode the frankincense based on localities of harvest. Quantification of key chemical constituents in the frankincense and essential oils across all species using new advanced analytical methods
- There must be more evidence based research on pharmaceutical uses of frankincense and clinical studies
- Understand how climate change is influencing frankincense production and tree growth and chemical composition. Environmental factors play a major role in deforestation of frankincense population! Acidic soil, acidic heavy rain (climate change)
- There is a need to further investigate the "overharvesting" and develop purpose target-harvesting process (more useful and less labour work and sustainable)
- Identifying biomarkers to evaluate the health status of the tree
- Investigate the chemical composition of the resin of different Boswellia species to establish the chemical profile of each Boswellia species and how that is affected by the location and the way of harvesting and other factors.

Suggestion made by Rizwan Fadiliah to contact the Government of Pakistan as they have 10 billion tree Tsunami project in regions similar to Oman, especially Balochistan province in Pakistan.

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> *"There is absolutely no research on this but disappearance of Fog in Sanaag Region and Jebel Samharan in Dhofar due to climate change is likely to have major impact on the quality end."*

Theme 4: Supply chains, products, regulations and trade Breakout room leaders. Professors Ben-Erik van Wyk and Tony Cunningham, Denzil Phillips

WHAT WE NEED TO KNOW

- Disambiguation of species and source regions in our discussions.
- We need more information about the products of each species and what quality means in each case. In what form is frankincense exported (raw materials versus essential oils versus finished products)?
- There should be more information about traders and if they have a code of ethics that conforms with modern codes of ethics in supply chains. Support people who care to know and seek out ethically sourced products and commercial entities and avoid those who do not. There is a need to educate the younger generation on what it means and what is needed to manage and harvest the trees properly and sustainably.
- Where and under what circumstances is sustainable harvest possible? We have already heard today of the ranges of different harvesting practices. Boswellia neglecta in the dry season in Samburu where the women collect, which is similar to Commiphora wildii in NW Namibia as models of sustainable wild harvesting. We have also heard cases of destructive intensive tapping and cutting the trees for domestic and other uses. So, framing the question in a positive way. 'Where, and under what circumstances, is there successful, sustainable harvest occurring?

- How can supply chains from different production regions and different species best be developed and communicated in relation to markets, prices and supply chains. How can transparent supply chains be developed?
- Given the incredible complexity and the difficulty of monitoring quantities and from what species that varies across the region, the overarching question of 'How can transparent supply chains from different production regions and different species best be developed and communicated and then who pays for that?' This is a real gap in knowledge. Will consumers be willing to share the costs of sustainable harvesting and supply chains and third party certification if they are educated? It will not happen on its own and suppliers cannot always just pass the costs onto the consumer. So again framing the question in a positive way. 'Where and under what circumstances are there unadulterated and high quality supply chains occurring? There is a need to involve all stakeholders, local communities, non-governmental organisations, local, regional and national governmental agencies and services, and the private sector
- How to prevent the issue of elite capture within supply chains. We talked about examples in other species. e.g. Prunus africana was CITES Appendix II listed in 1994 due to decades of mismanagement once Cameroonian entrepreneurs became involved in the trade. Today, one influential Cameroonian trader has the monopoly on all the bark exported from Cameroon, reducing the incentive for local people to cultivate and trade in Prunus africana bark. One does not want this to become a similar situation in Boswellia, especially where cultivation is starting, such as in Salalah, Oman. A counterpoint example to elite capture is the formation of producers associations, such as for the baobab export trade in southern Africa, which is a very interesting model.
- Cultivation: - where and under what circumstances can cultivation be successfully scaled out to supplement wild harvest as there are a range of circumstances. On the one hand, it is tempting to say well ' let's have restoration and enrichment planting in the wild areas', but tenure over those trees is often weak. Cultivation in plantations or agroforestry systems may have stronger tenure and management systems. So we need to understand the property rights in each case. How can the challenge of weak tenure over the trees, or the land on which the trees are growing, be overcome? We are all familiar with habitat loss with Boswellia papyrifera or grazing impacts on almost all the Boswellia species including B. serrata in India, but how can these challenges of weak tenure be overcome?
- What regulations can be used to improve the long-term survival of the trees and the harvesting communities? The main knowledge gap is what regulations can be used to improve the long term survival of the trees and the harvesting communities. There are various mechanisms in which this can be done. There is legislation, and international treaties. There are things like Fair Trade and so on and it would be nice to interrogate all the different ways and to find out which of these is most appropriate to ensure the long term survival of the trees and to improve the plight of the harvesting communities and to maybe get them better organised and improve their standard of living.
- Address any knowledge gaps between the generations and identify what education is needed.
- Create working based on each species and region.

WHAT WE NEED TO DO

- Need to identify the relationship between local and international taxonomies and products.
- Create a study to understand what drivers have weakened customary use rights, including the conflicts that drove people away.
- Establish the criteria for quality standards for each species and product.
- Set up trials with blockchain and use new technologies to raise awareness and meet the sustainability expectations of the younger generations who can then scan a QR code on a smart phone which can show photographs or data right across the supply chain from harvest to distillation to final product. Use new technologies to by-pass any large scale trader's focus on low cost and lack of interest in origins or quality.
- Implement a study on the reasons for little cultivation, including technology, incentives and policy support.
- Implement a study using workshop and questionnaires, on gathering comprehensive information on which products are being traded and demystifying current supply chains and volumes and types of trade. This information is needed to identify the problems so that effective interventions can then be designed.
- Once again, we said that there should be workshops on the different treaties. Implement a study using workshop and questionnaire on the range of possible interventions that exist and could be applied at local, regional, national and international levels. Evaluate the most effective of the many different mechanisms, including education, available to intervene to support sustainability as well as community development.
- Create sub-committees with specific tasks as a follow on from this meeting so that the momentum that has been built up and the expertise that this meeting has connected with, could really enrich and enable us to get deeper into some important questions on specific tasks that come out of this. Some supported regional groups and others adding in cross-cutting issues. 'If the cause is protecting Boswellia trees and the communities who are making a decent living out of it, educating the consumer to responsible buying, and fighting again biodiversity deterioration. It is a global cause that we embark on regardless of the region we are from. There is also the question of in what capacity we can contribute to this cause: R&D, community work initiatives, field support, marketing, processing, characterisation, social work. Should we set up groups by these main themes rather than by region?'

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> *"A lot of comments about block chain and similar analyses are only as good as the data you put into them - bringing us back to involving the communities and chains themselves"*

A broad interpretation of sustainability

On the final morning, Professor Frans Bonger's first paid homage to four of 'the greats' of frankincense who had been unable to join for different reasons.; Dr H. P. T. Ammon, Mats Thulin, Jason Elsamieh, and Amadé Ouédraogo. He then raised the issue of engaging a broader understanding of sustainability and the unfairness in the supply chains.

He emphasized that it is important to take a very broad interpretation of the term sustainability which includes not only ecological sustainability, but also

[3] http://uu.diva-portal.org/smash/record.jsf?pid=diva2%3A1410838&dswid=9505 Link to Mats Thulin monograph.

social and economic sustainability; otherwise interventions are not going to work. Communities around the trees and forest need the power, finance and incentives to maintain the forest. The connection is between communities as well as between communities and the environment because sometimes, communities are not rooted in environment. On the right hand side of the diagram are socio-ecological systems. These are a continuous interaction between what people do in environments, how they use the trees and forest and how their interaction with the environment changes it. 'All our actions have an impact; on the environment, on people; on everything we do'.

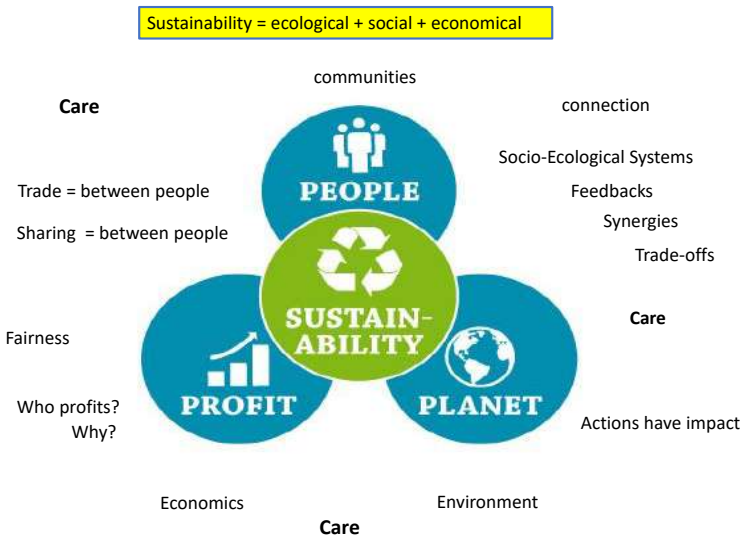
There is continuous feedback, synergy, and trade-offs between all the different aspects and some aspects can only be done at the cost of other aspects.

Trade is an integral part of the socio-ecological system, as it is the dynamic exchange of goods between people for the good of both sides. We need to understand why some profit more than others, and fairness may be connected to power, ethics, care, economic aspects, and to who profits and why so we can change it. Care is attention; it also may be love for the environment, for people.

Prof. Bongers then gave the example (loosely based on Ikg of Boswellia sacra in Somaliland) of how often only 1-2% given of the final price the consumer pays is for the harvester.

Trade	Price US$
Paid to harvester	3-6
Price paid to exporter	10-15
Wholesale price of oil from 1 kg	19.2
Range of Retail price paid for essential oil	103.5 – 476.10

Paying back 50 cents of the final retail price could double their income. Aside from India and Oman, most large scale essential oil distillation plants are not in the harvesting states and hundreds of tons



of raw resin is exported in bulk. The most profitable step is between wholesale and retail essential oil prices. What impact does more benefit accruing at the export, and international processing and retail end of the value chain have on local communities, sustainability and the long term future of the trees?

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Frankincense Poem

The workshop closed with a prayer and poem from Mr Shebhaz Khan.

The Takers by Shebhaz Khan

She stands alone in arid land
Soaking up the scorching sun
Majestic as she stands
Offering her jewels to the tribal hands
Tapping and extruding all there is to offer
Until like a child abandons the mother
Returning again when she has more,
otherwise would anyone really bother?

Her secrets are kept deep in the root,
One must travel a thousand miles
A journey that takes you so within
For many they don't know where to start
Her creamy white juice excludes
for us to find our truth
and reconnect us back to our heart.

When did you stop to give thanks
or kiss the hands of the man
standing beside her,
Do they really care for her and her community?
or do the colonialist corporations still believe
deep in the DNA they can just take
What did you give back?
Not even shoes, gloves an axe or a rake
these company morals seem to be fake.

Let us not make it too late
when her guardians open their eyes
every spirit will disperse and keep you awake.

She is Boswellia ,
your lover healer and friend
These words are just to remind you
Be in Love
She is just like your Mother.

> *"I think we can organize country or region specific groups to continue the discussions and take the work forward and continue link up with the main groups."*

A NOTE ON THE SPONSORSHIP OF THE WORKSHOP

The Global Frankincense Alliance has been set up as a UK based not for profit company. The interim coordinators and Advisory Board members have given their time and efforts for free. Since its inception in December 2019, 20 organisations and individuals have made contributions. Contributing confers no membership rights and is only an investment in taking the collective discussion and awareness raising on the Future of Frankincense forward. Since inception these contributions have paid for registering the company and URL, building the new website, a one month business zoom license to cover the workshop and paying for non GFA professional technical and zoom facilitation support.

In just 3 words: What inspired you today?

Additional Material 1:
Table of main points from harvesters groups

#	Species	Region/ Country
1	B.sacra	Somalia/ Somaliland, Oman
2	B.papryrifera	NW and W Ethiopia
3	B.neglecta	SE Somali region of Ethiopia and Northern Kenya
4	B.rivae	SE Somali region of Ethiopia and Northern Kenya

Some of the main issues and solutions are captured in the table below:

#	Problem	Country	Comment
	Trees		
1	Trees reported in poor health. Many due to repetitive overharvesting Too many cuts, 2 times a year	Somaliland	No harvest this year due to COVID Yield diminishing
2	Insect damage	Somaliland	'Harah' Shumuxshumux
3	Clearing the trees for other purposes	N.W.Ethiopia S.E.Ethiopia	Land clearance for agricultural purposes Use of trees for construction, firewood, charcoal and other household needs
4	No replanting or frankincense nursery	Somaliland Ethiopia	
5	Fire to clear the grass	Ethiopia	Fires set to burn the grass burns saplings
6	Grazing (cattle, goats, Camels) damages saplings and smaller trees	Oman Somaliland Ethiopia	Extent of impact of grazing on B.neglecta and B.rivae unknown.
7	Natural disasters, Climate change Landslides, winds, falling rocks, drought.	Somaliland Oman	
8	Adequate tenure, ownership or demarcation of the trees and forest lands	NW Ethiopia SE Ethiopia	
9	Lack of long term rather than short term project investment	NW Ethiopia	
	Harvesters, sorters, communities		
10	Lack of secure sustainable income or low season credit facilities	Somaliland Ethiopia	
11	Lack of alternative livelihoods and income	Somaliland	
12	Lack of stable, formal, accessible, secure market or market information	Somaliland Ethiopia N. Kenya	
13	Very labour intensive, walking in remote areas	N. Kenya	

#	Problem	Country	Comment
	Trees		
14	Poor harvesting skills	Somaliland	No harvest this year due to COVID Yield diminishing
15	Lack of proper working conditions, safety, PPE equipment	Somaliland	Fatal accidents, sorters have lung, kidney and other physical conditions from dust and sitting long hours on the floor
16	Lack of water, food, emergency and other healthcare (animal attacks, malaria)	Somaliland SE Ethiopia Kenya	
17	Insecurity (kidnapping, animal attacks)	Ethiopia	
18	Lack of post-harvest collection centres and resin handling and storage	SE Ethiopia N Kenya	
19	Lack of infrastructure, roads,	Somaliland	
20	Ineffective or unclear land use rights and rural-urban drift. Owners lease land and younger generation/ hired harvesters unfamiliar with traditional harvesting practices.	Somaliland Ethiopia Oman?	
21	Lack of effective and coordinated local institutions or implementation of local, regional or national policies and regulations that organise and incentivize communities.	Ethiopia Somaliland	Some good policies exist but are not effectively implemented or supported. E.g. requiring agriculturalists to harvest their own trees without training or incentives.
22	High harvesting royalty fee	NW Ethiopia	

#	Solution	Country	Comment
	Trees		
1	Reduce the number and frequency of cuts on the trees. Harvest once a year Rest for some years	Somaliland	Healthy B.neglecta and B.rivae trees reported in Somali region of Ethiopia and Northern Kenya with natural exudate collection (no tapping)
2	Focus on species - specific quality rather than only resin quantity	Ethiopia Kenya Somaliland	
3	Insect care	Somaliland	
4	Make shallow water ways, contours to harvest annual rainfall and prevent landslides	Somaliland	
5	Forest demarcation and forest land certification. Clear tenure and ownership within extended clan-based pastoralist systems	Ethiopia	
6	Set aside exclusion zones of trees and forests to allow healthy tree regeneration	Ethiopia	
7	Construction of fire lines		
8	Production and planting of seedlings	Ethiopia	Natural regeneration reported in W Ethiopia and N. Kenya
9	Undertake quantitative surveys and survey plots to determine tree population status and threats in the wild	Oman	
10	Fair and increased pay for harvesters and sorters in contractual agreement with credit facilities to provide regular secure household income	Somaliland Ethiopia Kenya	
	Harvesters, sorters, communities		
11	Provide market information, improved regulation and linkages to ethical traders and exporters. Shorten the value chain and maintain harvested quality.	Somaliland Ethiopia Kenya	

#	Solution	Country	Comment
	Trees		
12	Create a research and training centre of excellence in the harvesting region	SE Ethiopia	Focus on local/western species taxonomies and species specific harvesting.
13	Community education and awareness programmes for benefits, conservation and sustainable harvesting and use	Somaliland Ethiopia	
14	Provide proper harvesting training and safety equipment	Somaliland Ethiopia Kenya	
15	Provide transport, food and water and emergency medical support	Somaliland Ethiopia Kenya	
16	Legalise, allow and provide skills training of hired harvesters and those new to it	Somaliland Ethiopia Kenya Oman	Research needed on B.neglecta and B.rivae sustainable tapping benefits
17	Health and education facilities	Somaliland Ethiopia	
18	Create, monitor and learn from cooperatives	SE Ethiopia	
19	Support of gender involvement on the conservation, propagation, harvesting and utilizing frankincense products to empower women to participate in all the activity of restoration and conservation strategies through training and giving practical activities and also provide education support.	S E Ethiopia N Kenya	
20	Concern that CITES listing will negatively impact the trees	Oman	
21	All stakeholders to create much stronger relationships to the harvesters and trees	All	

Contact: **info@globalfrankincensealliance.com**
Website: **www.globalfrankincensealliance.com**

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Workshop initiation and design. GFA Coordinators and Advisory Board

Process facilitation team: Dr Sue Canney Davison, Leanne Davies with Ross Henry

Focus group design and facilitation: Dr Anjanette DeCarlo

Workshop report: Dr Sue Canney Davison with GFA Advisory Board and Theme leaders.

Photos: Sue Canney Davison, except: Samburu meeting, page 9: Isaiah Lekisike, Boswellia Carteri Somaliland, page 12: Haris Hassan

Report Design: Paul Gurney (www.thegraphicdesignshop.co.uk)