Restoring land and lives

Report of a scoping mission to examine the restoration and possible domestication of the Yeheb plant in Somaliland

Yeheb
seeds of hope

June 2015

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Executive Summary

This scoping mission was jointly initiated by Dr Muna Ismail, Lewis Wallis and Scott Darby, for the purpose of exploring the restoration and possible domestication of Yeheb in its original habitat in the Haud (or Hawd) Plateau of Somaliland.

Yeheb (*Cordeauxia edulis*) is a wild plant that is hardy to drought and a source of food to both animals and humans. It is believed to have significant potential for diversifying income and improving the livelihoods of the rural people in the drought zones of the Horn of Africa The plant is also known for its potential for soil conservation and land management in pastoralist habitats. Hence the successful domestication of Yeheb has the potential significantly to improve the lives of the people in this region.

The mission focused on two regions: **Togdheer** (in the Oodweyne district and Ali Essa habitat) and **Sanaag** (in its capital Erigavo). Togdheer forms a large part of the Haud Plateau and provides rangeland for pastoralists, while Sanaag on the east, presents a combination of land ecology.

The scoping mission found that Yeheb no longer grows in Somaliland and that it has vanished from the Haud rangeland north of the Ethiopian border. We have been informed that the plant exists only in selected areas in the Somali region of Ethiopia and we have managed to obtain samples in these areas, south of the border of Somaliland. This is the first study to document the **disappearance of this valuable plant** from large areas of its traditional range.

The most significant finding of the mission was that the disappearance of Yeheb is symptomatic of a larger problem facing the whole ecosystem of the country, namely **serious land degradation due to decades of poor land management**. Hence while restoring Yeheb remains a valid objective, it is clear that this can only be achieved by tackling the root causes of overgrazing and other pressures that have led to such serious degradation of the plant's habitat.

The study's key recommendation is to build **capacity in land restoration at clan and community level**. Without this capacity and the support of local people, any attempt to reintroduce Yeheb will succumb to the same pressures that have largely eliminated the plant from its traditional range. However once local communities share in a transformative social and environmental vision, the study supports the view that Yeheb has the potential to make a significant contribution to restoring both livelihoods and the local ecosystem.

This report is available to download from **www.yeheb.org**

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19th May to 6th June 2015

Dr Muna Ismail

Lewis Wallis and Scott Darby

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Introduction

Summary of the Scoping Mission

In the last two decades there have been fundamental changes in how land is used in Somaliland which has affected much of the ecosystem, and in particular the biodiversity of the grasslands of Haud plateau in Togdheer region. This central region of pastoralist heartland is classified as a hotspot of land degradation (**1**).

Yeheb is a versatile, rare and wild crop which grows well in arid region of the Horn of Africa. It has a great potential for being domesticated as staple food resource in drylands but also the potential to be used for soil conservation in land management and help prevent land degradation.

Regeneration of Yeheb in the original habitats would reduce chronic food insecurity in arid areas of Somaliland and the Horn of Africa. It could be part of a wider climate change adaptive strategy to bring back sustainable livelihoods for many of the pastoralist communities in the region.

The aim of the Scoping mission was to gather evidence about Yeheb in Somaliland and to find out the level of the existing knowledge of its use within the pastoralist communities;

- Engage and build relationships with the pastoralist and rural communities of the Haud rangeland in the Togdheer region and to locate a site within Ali Essa and Buhodle Yeheb domestication could begin in 2016.
- Ascertain the level of traditional knowledge of the use of this plant in their current lifestyle and what added-value Yeheb would bring to their livelihoods and nutrition.
- Explore opportunities for cooperation with potential partners, academics and civil society organisations within Somaliland
- Assess the capacity of pastoral communities to generate ideas for domesticating Yeheb in their habitats and how they see it could help them diversify their livelihoods.
- Look into the overall issues of the Togdheer rangeland ecosystem in comparison with that of the neighbouring Sanaag region.

About the Somaliland landscape

Somaliland is geographically situated in the north of Somalia. It is a de facto state which used to be known as the British Somaliland Protectorate until it achieved full independence from the United Kingdom on 26th June 1960. Somaliland united with Somalia, a territory under the UN-mandate of Italian Trusteeship, on 1st July 1960 and became the Somali Republic. This union came to an end on 18th May 1991 after the collapse of the central government as a result of civil war in the late 1980s and early 1990s.

In terms of landmass, Somaliland covers a total area of 137,600km^2 (equivalent to the size of England and half of Wales) with a coastline of 850km. It is mainly arid with an average temperature ranging from 25°C to 35°C. There are three main topographic areas defining much of the socio-economy of the country: the Guban (Coastal Plain), the Oogo (Coastal Range) and the Haud Plateau.

The Guban is a zone known for its high temperature and low rainfall. In the summer the average temperature can reach as high as 38-40°C. The Oogo (Coastal Range) is a mountainous area which lies immediately south of the Guban with an elevation of 1820-2200m above sea level and with heavier rainfall than the Coastal Plains. The Haud Plateau region is a savannah area south of the Oogo, an important grazing zone and the pastoralists' heartland. With a relatively higher rainfall than the Guban, it offers much needed surface water and pasture during the rainy season (**2**).

The Yeheb plant

Cordeauxia edulis, (*Leguminosae*) commonly called Yeheb or Yicib (in Somali), is a small tree or shrub species endemic to Ethiopia and Somalia. It is hardy to drought and a source of food to both animals and humans (**3**).

Yeheb produces a tasty edible seed, often referred to as a 'nut', of high nutritional and economic value. The energy value of this seed (446 kcal per kg), is twice that of the carob, and as much as that of soybean (**4**) .The seeds are also rich in fatty acids (**5**). The leaves are an important source of food and fodder for animals during the drought season (**6**, **7)**. Two variety of Yeheb are recognized; Suuley, a smaller variety from northern Somalia and Muqley, a taller and more common variety (**8**).

Both varieties are multi-stemmed plant with long massive root or taproot that reaches deep into soil moisture, making the shrub to remain green all year round. In addition the plant has also smaller secondary lateral roots (**4**) that develop 10-40 cm under the soil surface but can grow up to 2.5 meters long. For this reason direct seeding is recommended as moving seedlings may cause the taproot to break and plant to die. Only fresh seeds give good germination which normally takes 2 weeks. The seeds have low viability if kept for a few months. However seeds coated in wood ash and stored in a sack are known to remain viable for at least a year. Vegetative propagation is possible.

Under good natural condition there are up to 320 plants per hectare (**9**) with a seed yield of 5-8 kg per plant per season. The plant starts to produce pods after 4 years and production increases with age (**10** Baumer, 1983). Such is the demand and free access to all range plants that the fruits often collected from the shrubs before they are fully mature (**5, 11**, **and 4**).

Figure 1: Seed pods of the Muqley variety of *Cordeauxia edulis* (note germination in damp air)

Figure 2: Flowers of *Cordeauxia edulis* (photo credit: Professor Jarmo Holopainen)

Efforts have been made to domesticate the species and also to introduce it outside its natural habitat (**12**, **13**), but so far there has been no success, although a trial in Kenya is in progress (**14**). Two major projects have looked into the domestication and conservation of Yeheb. One was based in Bangor University under the Indigenous Fruit Trees of East Africa project which was funded by the Leverhulme Trust in 2007-2010. The other was carried out by the Swedish University of Agricultural Science Department of Crop Production Ecology.

Nutritional value: The seeds have a lower protein value than other leguminous seeds and pulses, but are rich in sugars and fats (**12**). They contain well-balanced amounts of essential amino acids, especially lysine (3.9-6.9%) (**13**), but they are deficient in tryptophan (**15**, **6**), methionine (**15**) and isoleucine (**6**). The seed lipids contain palmitic acid (26-31%), stearic acid (12-13%), oleic acid (31-32%), linoleic acid (25-30%) and traces of linolenic acid (**4**). The seeds also contain trypsin inhibitors (**15**), which are inactivated by boiling (**14**). The seeds are free from toxic phytohemagglutinins, lectins, alkaloids and glycosides (**15**).

Phytochemistry and medicinal use: There is little known about the phytochemistry of Yeheb. However it is known to contain cordeauxiaquinone (sometimes called cordeauxione) which produces a red pigment in the bones and tissues of animals that feed on the plant. Cordeauxiaquinone is a naphthazarin derivative compound with the formula $C_{14}H_{12}O_7$ and is the only naphthoquinone found in the Leguminosae (**16**). But very little is known about its biological activity or function. The metabolism of cordeauxiaquinone is not well known. With regards to any possible medicinal use; (**17**) claimed that cordeauxiaquinone deposited in bones might stimulate hemopoietic tissue to produce erythrocytes, both directly and indirectly so it might be useful medicinally to stimulate hemopoesis.

Historically, Captain Harry Edward Spiller Cordeaux, the High Commissioner of Somaliland in 1906-1910 who had a keen interest in the flora and fauna of the country, was the first westerner to discover Yeheb in the Haud Plateau. In 1907 he brought a sample of Yeheb back to Kew, England and subsequently this new plant was given the botanical name *Cordeauxia edulis* (**5**)

Recent reports indicate that Yeheb has vanished from many locations where it was noted by earlier travellers and, as a result, it is currently categorized as Vulnerable on the IUCN Red List. A recent study (**18**) on 10 villages in the Somali Regional State of Ethiopia where the only remnants of Yeheb exist (in the Haud areas of Horn of Africa), found that the population is diminishing and that the plant's natural regeneration is negligible. Our scoping mission confirmed the disappearance of Yeheb from large parts of its traditional range. Accordingly **we recommend that Yeheb should be categorized as Endangered on the IUCN Red List, based on criteria A1d, because it has vanished from many areas of its natural habitat in the Haud rangeland.**

Land degradation

Land degradation is a process which results from the reduction of land resources by a combination of factors including; soil erosion, wind erosion, long term loss of diversity of natural vegetation, reduction of soil nutrients and increased aridity. It is a gradual process that also involves the impact of human activities on land use. It may take some time for such negative environmental impact to be noticeable.

A more recent definition of land degradation says that it is the "reduction of the capacity of land to perform ecosystem functions and services (including those of agro-ecosystems and urban systems) which support society and development".

> "*Rearing livestock depends on having a sound environment, which is not there. In the coming 10 years if we don't reverse the damage that have been done to the ecosystem, I don't know what will become of Somaliland.*"
>
> Shukri Haji Ismail Mohamoud, Somaliland's Minister of Environment and Rural Development

Generally, there are three broad categories of land degradation: biological, soil and water. Biological degradation includes loss of biomass, biodiversity and loss of soil nutrients or life which would normally account for 37.89% of the damage caused by land degradation. Soil degradation happens when physiochemical conditions of soil have been negatively altered, e.g. salinization, acidification, loss of topsoil, organic and nutrient depletion. Water degradation includes changes in quantity of surface water, or decline in ground water. In Somaliland, loss of vegetation and diversity of plant species account for 30.48% of land degradation (**19**).

During our scoping mission we encountered many aspects of active and advanced land degradation in the two regions we visited, Togdheer and Sanaag: loss of vegetation, gully erosion, loss of topsoil, invasive species (*Prosopis Juliflora*), demise of Frankincense and Juniper forests and wide-ranging ecosystem degradation. **In general the impact of forms of degradation seemed to be negatively affecting the sustainability of traditional mainstay livelihoods.**

Figure 3: *Prosopis Juliflora* (Garanwa in Somali) taking over the degraded land in Oodweyne district

Climate change-induced ecological stresses, the increase of human and livestock population and changes of national and global economy, are the main concerns people expressed to us. They believe they are influencing the changing patterns that have been occurring in land use. These land use changes have been impacting negatively on the land resources (soil, vegetation). **In places we visited, land resources are being stretched beyond the land's natural ability to recover and there is a serious need for rangeland restoration.**

The economy of Somaliland is heavily dependent on ecosystem services with its most significant source of economic wealth being livestock. 65% of the population depend either directly or indirectly on livestock or livestock products for their livelihood (**20**) Crop husbandry provides subsistence for about 20% of the population (**20**). Foreign aid and remittances from diaspora also play a significant role in the economy.

Historically, there have been a number of laws introduced in Somaliland with regard to land management during colonial times or the reign of the subsequent central government. These laws brought demarcations and change of land ownership from communal to individual, with negative consequences on livestock movement and grazing patterns. The laws are responsible for many of the problems exacerbating land degradation, particularly in relation to charcoal production.

Charcoal production was regularized before 1990, but after the collapse of the central government, it became a lucrative business that is causing serious land degradation. It has completely destroyed many of the acacia forests providing protective cover for the fragile soil. Such degradation was apparent in the gully erosions and topsoil loss we encountered in many areas we visited.

The chairman for the Parliamentary Subcommittee on Natural Resource, Mr Said Warsame Ismail informed us during our visit that there will be an upcoming Environment Act for Somaliland which will help with the regulation of many of the critical ecological land use issues in the country.

Part of the problem is that the general outlook of the population is primarily to draw maximum financial benefit from the ecosystem. Protection of the environment and a sustainable ecosystem do not rank high in peoples' priorities.

Somaliland being a post conflict state which is still in the process of developing a stable and peaceful society, 43% of its revenue goes to maintaining security within its borders (**20**). What remains from that limited revenue is not enough to cover the needs of the country. Hence, there is a heavy dependency on International NGO development programmes.

Somaliland's "Vision 2030" strategy recognises environmental protection as one of the five pillars earmarked for the national development agenda promoting 'a stable, democratic and prosperous' society. Sustainability is a guiding principle of this vision and highlights the preservation of natural resources (**20**).

There are major factors undermining the realisation of this vision. Soil erosion, deforestation, droughts and climate stresses, overgrazing of rangeland, urbanisation, population growth and pollution (lack of waste management) are all challenges for a sustainable ecosystem that can provide necessary goods and services to support viable growth, long term stability and peace.

Figure 4: Active overgrazing in the Haud rangeland during spring time

Community discussion and focus groups

During the 14 days scoping mission spent in rural areas, we held 3 participatory community group discussions and 2 focus group meetings with mixed-gender university students. To stimulate discussion, we screened two short documentary films made by Initiatives of Change: 'Two Boys and an Orange' (about finding ways of sharing resources), and 'An African Answer' (about mediation between ethnic groups in conflict).

Our visit started with Togdheer region and progressed eastwards to Sanaag region. The purpose of Sanaag leg of the trip was not to scope Yeheb availability in that region but to connect with the people and explore their issues of concern vis-à-vis land degradation in comparison with Togdheer.

The overriding concern emerging from these community and focus group meetings was the need for urgent changes in land management practices to halt the advancing degradation of the ecosystem.

People were also concerned about land use policies and the lack of vision to inspire collective ownership of sustainable development. There was also an overall acknowledgement of the lack of awareness and capacity to educate people in the need for change.

We learned that generally people were aware of the land degradation that was taking place in both Togdheer and Sanaag and its impact on pastoralist livelihoods. From our discussion with various community and focus groups in both regions (Togdheer and Sanaag) there was strong indication as to how land conditions had deteriorated in the last three decades. *"The outlook in this part of the country seems bleak because of the state of our habitat"* - a young man in Burao.

"Perception and the attitude of people are a hindrance to solutions and that's why people who might be aware of the problems, stop trying. There is no critical mass even though this is the issue of our time… and to me that is just mind boggling" - a young woman in Erigavo/Sanaag region.

Issues in Togdheer

The challenges that the pastoralist communities in Togdheer region face mainly revolve around:

- Degradation of ecosystem (loss of or diminishing vegetation)
- Scarcity of water
- Lack of alternative energy sources
- Overgrazing of rangelands.

In addition to poor conditions of the communal rangeland, land-use management and climate stresses, there is also a prevailing social mind-set that seems to be devoid of any collective ownership of the problem. The societal outlooks in both of the regions we visited for this scoping trip were not compatible with sustainable livelihood. Competing interest for land use mechanisms may play a role in changing the current maintenance of peace and social harmony in Somaliland.

A shepherd whom we met on the way to Oodweyne district in Togdheer mentioned that he is finding life hard to be frequently moving his flock to find communal pasture in rangeland that is increasingly degrading.

As a result there has been a reduction of species composition of important fodder plants and wild food sources for pastoralists. In the village of Ali Essa (see map in Appendix 1) we were informed that 8 to 9 species of plant that were wild food crops, which are valuable to the livelihood of the people that live in the Haud Plateau, had disappeared totally from the ecosystem.

The quality of pasture in the rangeland has been deteriorating and a prevailing viewpoint was that Yeheb may have been present at one point (a long time ago) across the Haud but the fact that it is no longer available north of the border is symptomatic of the extent of the land degradation which has taken place. Yeheb is also disappearing south of the border and is receding even more rapidly within Ethiopia. A major problem for its disappearance and the imbalance in its population, is the constraints on its natural regeneration due to over-harvesting of immature nuts, excessive grazing of shoots and leaves by livestock, and excessive cutting of wood for fuel and construction.

Normally, sites where Yeheb grows are often covered with open grass (e.g. *Aristida kelleri*) and scattered but dense clumps of shrub species, mainly of Acacia and Cordia spp., *Cordyla somalensis* and Grewia spp. These are intermingled with other trees *Acacia tortilis*, *Albizia anthelminthica* and *Delonix elata*. Local residents have seen many of these plants dwindling in the landscape around Ali Essa village. This provides further stark evidence for Yeheb's demise in the Haud plateau. Hence it is hardly surprising that this plant has vanished totally from the north of the Haud Plateau on the Somaliland side and is receding towards few areas, 30-60kms south of the border in Ethiopia. The nut is brought to the markets in Burao during its harvest seasons in May and October.

In Oodweyne district, at the community participatory workshop we held on 25th May, we were informed by four people of various ages that they buy the nut and find it very sweet and nourishing to eat. When we asked them if they had ever thought of planting Yeheb in their local area for their own consumption, their response was unanimously "*it never crossed our minds, but it would be a good idea to grow it"*.

One 70 year-old man described how as a young shepherd he used to graze his sheep in Buhodle area (see map in Appendix 1) where Yeheb was growing. He could vividly recall the teeth and bones of the animals showing red pigments from the Yeheb leaves, the succulent

taste of the meat and the higher yield of milk he used to get from his animals. This was in agreement with what the pastoralists in the central region of Mudug and Galgaduud in Somalia relate about the reason why they prefer their herds to graze on Yeheb.

Figure 5: Ali Essa habitat, typical of Haud rangeland

Issues in Sanaag

In Sanaag, although generally the environmental issues were similar, there was not so much scarcity of water. Sanaag features a mild version of semi-arid climate and is home to woodland of highly endemic flora. In comparison a large part of Togdheer is seriously degraded.

Figure 6: Land degradation in Sanaag

We were unable to determine whether indigenous knowledge, viewpoints and participations were missing influences that could have helped mitigate land degradation, or whether on the contrary these were the actual reasons for poor adaptability to climatic variations. This would be an important issue to determine in helping local people to build their capacity for sustainable land management.

Issues of the Frankincense forests in Sanaag

The majority of Frankincense in Somaliland grows in Sanaag region, in the forests of Cal Madow Mountains which extends from Erigavo (in Somaliland) to the west of Bosaso (in Puntland). These mountains are part of the Golis mountain range that stretches across the Horn of Africa. In addition to its relatively higher rainfall within Somaliland, the mountain forests of Daallo and Surod in Sanaag also receive good precipitation in the form of fog and winter rains which sustain its isolated flora (**21**).

Somalia's biological diversity is an important part of Conversation International's Horn of Africa Biodiversity Hotspot among 34 hotspots worldwide. Although research into flora in this region is on-going, it is estimated that the Horn of Africa is home to 5000 plant species, 55% of which are endemic species. Many of these species grow in the northern regions, Somaliland. According to an IUCN (2000) report (**22**), Daallo and Surod, also highlights the biodiversity aspects of Sanaag mountains and points out that much of this region is biologically unexplored.

Frankincense has been a valued commodity for trade for millennia, and the northern coast of Somaliland for a long time benefited from this ancient trade. There are two types of Frankincense (or *Boswellia*) that grow in Somaliland:

1. *Boswellia sacra,* also known as *Boswellia carterii* (Mohor in Somali), yields resin known locally as *Beeyo*; and
2. *Boswellia frereana* (Yag'ar in Somali) yields resin locally called *Meydi.*

Of the two types of Frankincense, *Boswellia frereana* is an endemic species found only in the Somali region. Harvesting Frankincense involves making a number of incisions (or tapping) into the bark of the tree allowing the resin to exude. This resin is then allowed to solidify on site over a number of weeks before it is collected. It is very labour-intensive, and harvesting by such traditional methods kept the indigenous knowledge alive.

However, the actual trade of Frankincense has stood still in time to the disadvantage of the harvesters, while the world it supplies has modernized. The tree owners and resin harvesters are at the bottom of this supply chain, and have become disconnected from the outside world. The beneficiaries of much of the profit are the middlemen and the end-product producers who may not be so much concerned with the sustainability of the Frankincense forests.

During our mission we noted many Frankincense trees while travelling through Tab'a Gorge (northwest of Erigavo) which were heavily tapped, and in several cases tapped to death.

The practice of such excessive tapping is known as ‘slaughter tapping’ and is commonly seen in rubber tree forests in Asia.

The elders who are the representatives of the inhabitant clan families (owners of the forests) shared their concerns with us and their fear about the demise of the Frankincense trees particularly the *Boswellia frereana* species.

They said many valuable trees were being killed and that the forests were heavily used by middlemen for business while the owners received little. They believe that continuing to let this happen will erode the human, social and natural capital Sanaag has built through millennia of experience in the Frankincense trade.

We thought dialogue was needed between the owners and the middlemen who seem to be mainly benefiting from the forest, so as to ensure the sustainable use of this valuable resource.

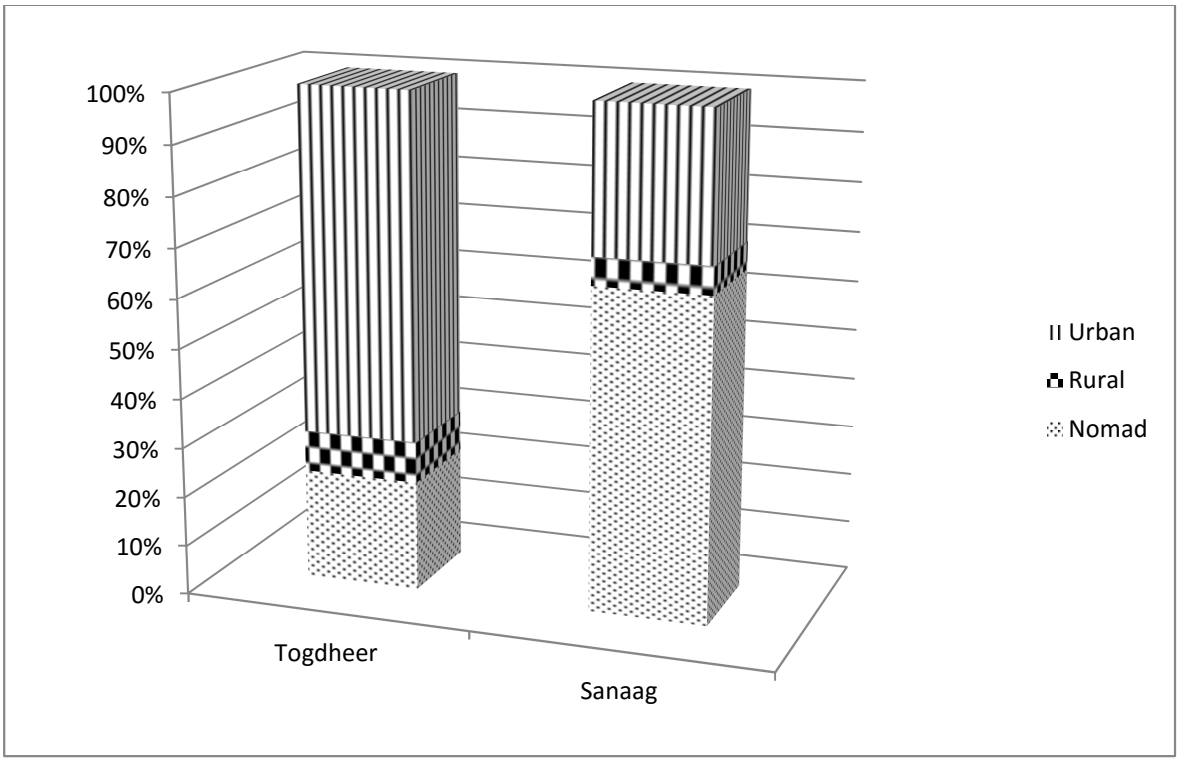
Figure 7: Frankincense trees near Erigavo/Sanaag

Findings of the mission

Our findings are as follows:

- An ecosystem that is under pressure from an increasing population resulting in desirable plant species being unsustainably extracted and replaced with less desirable ones
- A livelihood model that is focused around maximizing short term extraction of environmental resources at the expense of long term sustainability
- A large youth population that is struggling to find employment and is congregating in the cities (please see Figure 6 below)
- Severe degradation of soil and vegetation over the entire country observed during our travel from Hargeisa to Erigavo, and indicated by the failure of Yeheb and other species
- Overgrazing of the ecosystem by camels, goats and sheep degrades the land and leaves the pastoralists vulnerable to stresses such as droughts and animal diseases.

Figure 8: **Populations of the Togdheer and Sanaag regions**



Data based on estimated population of Togdheer (712, 363) and Sanaag (544,123). Total Somaliland population is (approx.) 3 million (Source: UNFPA population Estimation Survey, 2014)

Recommendations

Yeheb has disappeared from the land due to variety of different reasons. The disappearance of Yeheb can be viewed as a symptom of a deeper ecosystem stresses as a result of land degradation. Hence unless issues around sustainable rangeland use and resource sharing are addressed, it will be difficult to restore Yeheb and many other plant species that have already vanished.

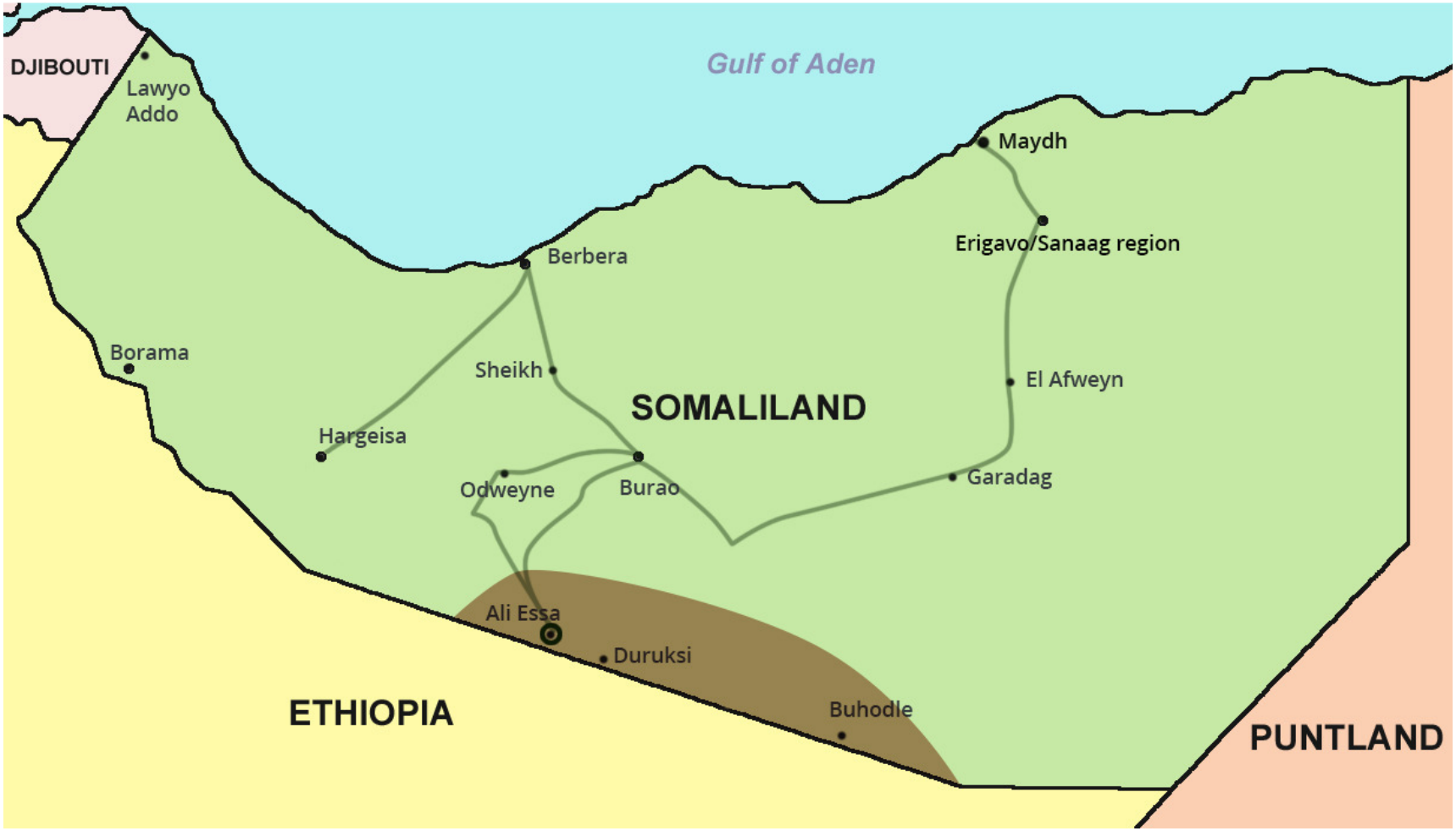
Alongside the reintroduction of Yeheb we recommend the following to help reduce the causes and impact of current land degradation in the Haud pastoralist areas:

- Build capacity of communities in land restoration at clan and community level.
- Create a learning centre in collaboration with existing Dialogue Facilitation Organisations or through local universities to help establish a centre for resource sharing and land and ethical governance, where sustainable peacebuilding, human security and social/economic development are inspired.
- To encourage learning in using new and old knowledge to help educate the communities while providing them with tools to enable improvements of degrading habitat and land management. This could be channelled through local universities to do outreach community trainings.
- A new approach is needed to work with all the stakeholders to arrest and reverse the various processes of land/vegetation degradation.
- Facilitate capacity to increase resilience and bring in adaptation for climate change impacts, restore degraded land and maintain existing productive land.
- Provide training for communities to participate in dialogue and create the participatory mechanisms to implement decisions.
- Capacity-building and inclusion of women in decision making.
- Build local capacity on how to add value to local produce.
- Inspire a critical mass of the young population by promoting sustainable and transformative social and environmental vision.
- The same solutions can be applied to other economically useful plants such as Frankincense. Hence our final recommendation is to promote a sustainable and ecologically sound value chain for the Frankincense trade through community dialogue leading to sustainable harvesting practices.

Appendix 1: Itinerary

• 18th May	• Fly out to Hargeisa via Addis Ababa
• 19th May	• Arrival in Hargeisa
• 20th – 22nd May	• Relationship building, meetings, and discussions on project plan and trip with key Ministries and organisation in Hargeisa.
• 23rd – 27th May	• Visit to Togdheer Region pastoral/agro-pastoral communities in Ali Essa and Oodweyne district. Conduct participatory workshop of mixed age and gender
• 28th May	• Return to Burao overnight
• 29th May – 1st June	• Visit to Sanaag/Erigavo
• 2nd June	• Overnight stay in Burao
• 3nd – 6th June	• Return to Hargeisa and evaluation of the outcomes. Visiting key officials to discuss findings of the trip and writing of the preliminary report preparations
• 7th June	• Fly back to UK

Appendix 2: Cities and villages visited during the scoping mission



Appendix 3: Biographies of participants

Lewis Wallis studied at Wye College, London University where he earned his BSc in Agriculture. Wallis was also awarded a Diploma in Tropical Agriculture at the University of West Indies in Trinidad. He spent four years in Dominica establishing estate banana production centres for export. He worked for five years in Swaziland on an irrigation scheme growing citrus and sugar cane and also as a settlement officer on the development of Vuvulane Irrigated Farms (VIF), a scheme enabling Swazi farmers to access the sugar industry as quota holders and employers rather than labourers. His experience also includes two years in Zambia on settlement schemes and a year in the Eastern State of Nigeria establishing a new sugar scheme.

In 1989 Wallis retired but continued to work voluntarily with newly emergent farmers in the Ukraine. He is a member of the Farmers Dialogue, a programme of the international charity Initiatives of Change. He is a prime mover in the team that established Grampari, a rural development organisation that works with communities in Maharashtra, India. He is currently involved with projects and expeditions as part of Initiatives of Land, Lives and Peace (ILLP) and the Yeheb Project, both of which are associated with Initiatives of Change.

Dr Muna Ismail is a development consultant for initiative of Change (IofC)-UK. She is a scientist and environmentalist, with a passion for community action and sustainable development. In the last 2 years she has been developing dialogue facilitation training programmes for UK Somali Diaspora community groups. She was a public health researcher at East London and the City Health Authority (ELCHA). For over 12 years she worked with various UK charities, including the mental health charity, Mind, which partly sponsored her PhD research on Khat; a psycho-active plant popularly used in East Africa. She did a brief stint in the US as a technical consultant for a natural products company in Seattle. Dr Ismail completed her doctoral research at King's College London in 2011 and subsequently held a visiting postdoc research analyst at the School of Pharmacy, University College London in 2012 and at the Royal Botanic Garden, Kew, in 2013-14. She is interested in dryland wild crops in the Horn of Africa and is currently working to develop a project on the Yeheb plant's restoration and possible domestication in Somaliland.

Scott Darby is a scientist who specialises in Arid Lands. Scott has previously worked for the Ministry of Agriculture in Libya and has been working as a project manager for Initiatives of Change, UK since August 2014. Scott's academic achievements include two MSc (Hons) in Arid Land Studies, a BSc (Hons) in Environmental Sciences and he is an Associate member of the Institution of Environmental Scientists. In addition to this, Scott has recently assisted in reviewing chapters for a book entitled - Land Restoration: Reclaiming landscapes for a sustainable future.

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Initiatives of Change

Initiatives of Change, 24 Greencoat Place, London SW1P 1RD United Kingdom
Telephone: +44 (0)20 7798 6000 Email: info@uk.iofc.org