

# **Sustainable Dryland Resources Management for enhanced Livelihoods, Food Security and Climate Change Adaptation in Somalia**



The Somali Institute for Environmental Peace (SIEP)

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## EXECUTIVE SUMMARY

This report on **Sustainable Dryland Resources Management for Enhanced Livelihoods, Food Security and Climate Change Adaptation in Somalia** investigates the factors causing land degradation and deforestation based on consultations with stakeholders to identify actions to reduce deforestation and increase the resilience of ecosystems and households, and sequester carbon.

Over the past 30 years pressure due to increasing demand for wood-based energy for local consumption and illegal charcoal exports, weak governance, insufficient protection and climate change have impoverished forest ecosystems in Somalia. These drivers have also undermined the adaptive capacity and strategies of rural communities and rendered them increasingly vulnerable. Given this context, this study provides data on resource exploitation, drivers of deforestation, the identification of locally preferred multi-purpose woody species with socio-economic and ecological importance for agroforestry uses, the role of governance and political economy related to the development of commercially important non-timber forest products (NTFPs) value chains, vegetation cover change and institutional capacity gaps related to natural resources management. The study covers three federal states: Galmudug, Jubaland and Puntland.

The study design and research methodology based on co-developed, participatory approaches with stakeholders included a **stakeholder analysis** (SHA) and engagement, an **ethnobotanical survey** to identify locally preferred woody species and NTFPs of socio-economic potential for agroforestry use and value chain development, **value chain mapping** and **analysis** of local, regional and international trade. **Political economy analysis** to understand the political, economic, social and institutional contexts in which NTFPs are harvested and traded. **Focus group discussions** were carried out with the main stakeholders in NTFP value chains including government officials, policymakers, public and private institutions and non-governmental organisations and traders.

The results indicate that there are significant impacts of deforestation and land degradation on ecosystem integrity (Composition, structure and functionality) and on livelihoods in the three states of Jubaland, Puntland and Galmudug. The natural resource base in the three study areas are threatened by deforestation, droughts and over-grazing, weak in environmental governance and natural resources management capacities. Over 90% of all the individuals interviewed in institutions had received no formal environment and natural resources management training.

In terms of the livelihoods of the pastoral and agropastoral communities in the three states, NTFPs make a economic contribution, especially in poor households with 65% of households interviewed indicating that NTFPs are used for subsistence and as safety-nets in times of hardship and 30% sold. Firewood and charcoal production and sale are the dominant forest income generating activities for over 80% of the population. Commercially important NTFPs include aromatic resins *Boswellia frereana*, *Boswellia sacra* (frankincense) and *Commiphora myrrha* (myrrh), traded nationally and internationally. These value chains are constrained by the political economy, weak governance, poor infrastructure, drought, and climate related impacts and conflicts. *Cordeauxia edulis* (Yi'ib) nuts are highly nutritious, provide a staple food for pastoralists and are traded locally. Multi-purpose woody species such as *Cordeauxia edulis*, *Dobera glabra* Forssk., *Berchemia discolor* (Klotzsch) Hemsl., *Ziziphus mauritiana* Lam, *Grewia penicillata* Chiov are used as food, medicine and sold.

Power and forest resources are distributed in Somalia in formal and informal, domestic and international stakeholders. These actors operate in various contexts and markets, with differing consequences on forests and the value chains of non-timber forest products.

Strategies to introduce potential NTFPs producing species for agroforestry use for the purpose of genetic conservation by using and to reduce pressures on the natural vegetation are: develop and implement a national agroforestry strategy; encourage a wider adoption of agroforestry at field and policy level by



interacting with land users and owners; promoting the use of trees outside forests and in agriculture in both forest management and agricultural policy and facilitate ‘xeer’ (customary laws and practices) revitalization for resource management especially of common areas e.g pasture and rangelands, forest areas.

Strategies to strengthen the capacities of local research and government institutions through training and mentoring on environmental valuation methods, environmental protection and research uptake, and empower local decision makers to draw upon recommendations during policy formulation and implementation of control measures for environmental issues. Specifically, this could include coming up with a framework to use the potential of rangeland conservation for carbon sequestration to access private finance from the carbon market.

Recommendations include the development and implementation of national forest and land management policies; programmes and projects aimed at developing key NTFP value chains; tree planting/agroforestry of identified NTFPs producing species, incorporation of multipurpose trees in existing farming systems to reduce pressure on the natural vegetation; investments in environmental and climate change human resource capacity development in collaboration with the country's higher education institutions.

It is also recommended to take into consideration the political economy when looking for ways to implement the reforms in the forest, trade and development in Somalia. What is especially necessary is a social contract that ensure that all actors are engaged in co-production of knowledge, governance and management of trees, forests and agroforestry resources.



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### SIEP

The Somalia Institute for Environmental Peace (SIEP) is a non-governmental and non-profit Institution. Envisioned to conduct research, education, and Consultancy services, to increase environmental awareness, promote peace in Somalia, and contribute to the horn of African region.

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## 1. Introduction

Somalia is situated in the Horn of Africa and has a total land area of 637,540 square kilometres, of which forests cover 11 to 14 percent - mostly classed as low-density wood (CEA, 2020). Climatically, hot conditions prevail year-round. Poor soils and low rainfall limit growth in forests, despite the climatic conditions. The vegetation is predominantly dry deciduous bush land and thicket dominated by *Acacia* and *Commiphora* species, with semi-desert grasslands and deciduous shrub land in the north and along much of the coast, denser vegetation towards the south, and many plains in the north-eastern devoid of trees (IUCN, 2006). Somalia contains a significant amount of biodiversity, including over 5000 plant species and 1332 animal species (NBSAP, 2015). This biodiversity, particularly woody species and non-timber forest products (NTFPs) contribute to the national economy and support the livelihoods of many people as a source of firewood, animal fodder, medicine, food, export earnings and building materials particularly for rural, pastoralist communities but also for urban transporters and retailers. Forests play a critical role in mitigating climate change impacts, soil fertility and erosion control, these ecosystem products and services shown in **Error! Reference source not found..**

*Figure 1: Ecosystem Service provided by forest in Somalia*



However, over the last three decades, forest ecosystems have been impoverished due to the escalating rate of deforestation and degradation due to fuelwood extraction, climate change, population growth and inadequate policies and legislation, expansion of agricultural land, unregulated growth of rough roads and villages, internally displaced persons (IDP) camps and increasing urban areas. There has been a growing demand for food while land productivity has declined. The annual rate of deforestation is currently estimated at 1.03 percent, almost twice the average rate of loss for Africa (0.62%) (CEA, 2020). Somalia lost about 686,000 ha of forest between 2000 and 2017, an annual loss of 40,000 hectares, accounting for at least 6 percent of all trees lost in Africa (Ibid). Stakeholders and interest groups, institutions (rules) and existing organisations and agencies responsible for forest management, interact in complex ways to determine how forest resource is managed and how the associated returns are distributed. When stakeholders' power and influence is uneven, institutions are weak (or deliberately weakened by the same vested interests), and organisations are inefficient and corrupt, the result is resource plunder, institutional erosion and breakdown of the rule of law, and concentration of wealth in a few hands. Any efforts at reform will be met by resistance by those who see themselves as likely to lose and support from those likely to gain (Kishor et al., 2015)

### 1.1 Objectives

The main objective of the study is to (i) Conduct baseline studies focusing on resources exploitation and specific problems related to livelihoods and environmental sustainability (ii) identify socio-economically and ecologically important multi-purpose tree species for agroforestry uses, and (iii) identify capacity building gaps for training institutions, farmers and farmer groups, and extension staff for scaling up agroforestry practices. Specifically, the study aims to:

1. Identify potential NTFPs tree producing species for agroforestry uses and conservation in Somalia.
2. Investigate the impact of governance and political economy on the commercial viability of NTFP value chains in Somalia
3. Analyse the dynamics of land use and land cover change in Somalia in order to determine the causes of deforestation and degradation.
4. Investigate institutional capacity gaps among the multiple ministries that influence land use changes to strengthen the capacities of local research and government institutions.

## 1.2 Description of Study Area

The study was conducted in four districts of three federal states shown in **Error! Reference source not found.**

- Guricel, Galmudug
- Kismayo, Jubaland
- Garowe and Bossaso, Puntland

The study areas were selected in consultation with the stakeholders, based on their local knowledge about NTFPs in the area, and local state institutions recommendations. The criteria used were the richness of NTFPs, local trade and production. The study sites share differences in terms of forestry activities and livelihoods and similarities in terms of richness in NTFPs with livelihood vulnerability due to high rates of deforestation (a 4.9% decrease in the period 2001 to 2021) (World Bank 2022) for livelihood subsistence use.

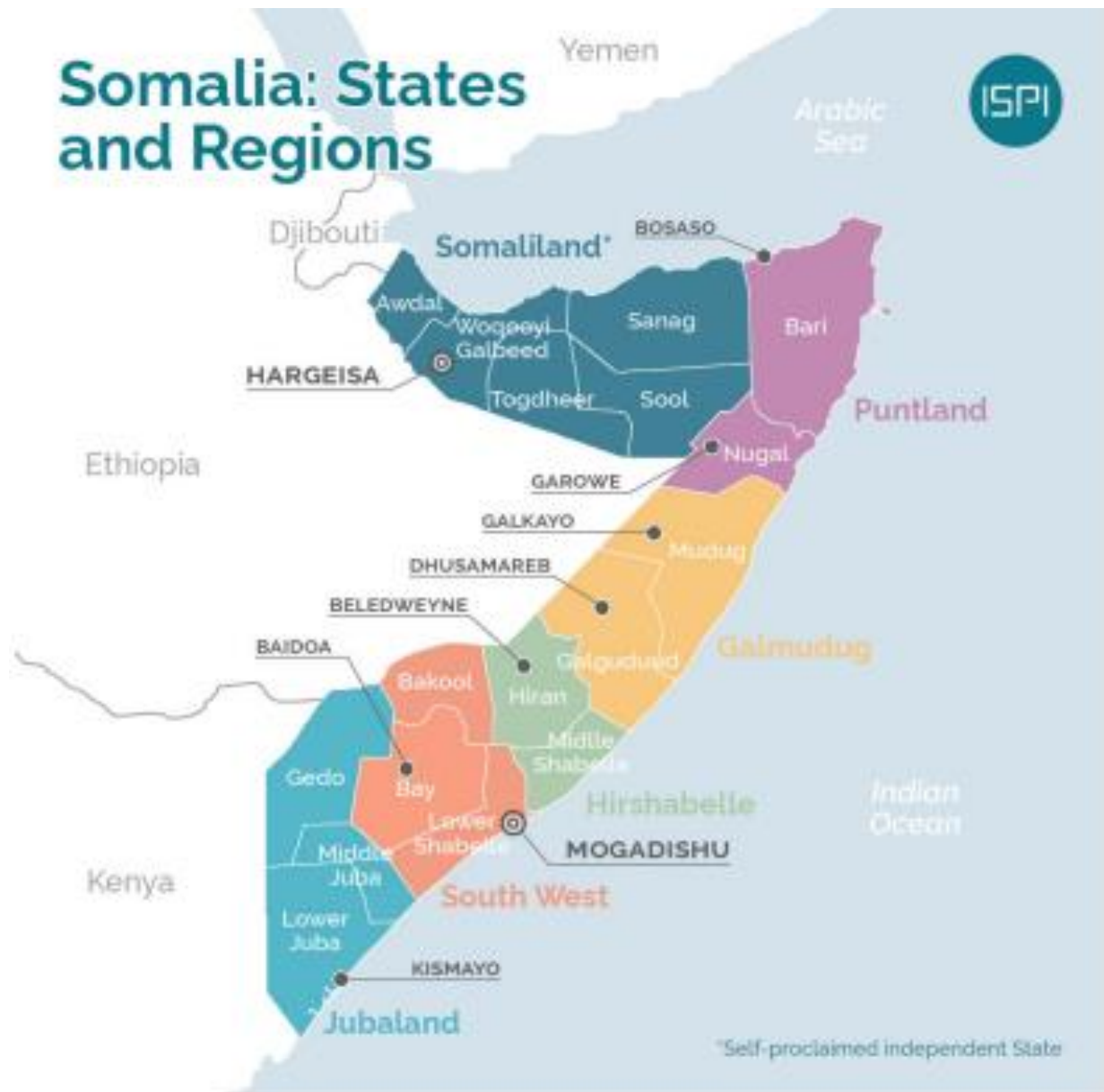


Figure 2: Map of Study Area in Somalia

Source: ISPI <https://www.ispionline.it/en/pubblicazione/somalia-states-and-regions-30387>

## 2. Methodology

This section presents the methods used to collect and analyse data for the study, and research challenges.

### 2.1 Data collection

Data on the value chains, governance and economy, agroforestry and policy and perceptions on the dynamics of land use change was collected using five different methods, shown in **Error! Reference source not found.** Additional data on the dynamics of land use change was also collected from national statistics and as part of a geospatial survey.

*Table 1: Overview of Data Collection Methods*

| Region  | State    | Number                    |                          |     |                           |                |                              |
|---------|----------|---------------------------|--------------------------|-----|---------------------------|----------------|------------------------------|
|         |          | Stakeholder consultations | Key informant interviews | FGD | Structured questionnaires | Market surveys | Capacity building interviews |
| Guricel | Galmudug | 1                         | 5                        | 3   | 133                       | 1              | 8                            |
| Kismayo | Jubaland | 1                         | 5                        | 3   | 132                       | 1              | 7                            |
| Garowe  | Puntland | 1                         | 3                        | 2   | 70                        | 1              | 5                            |
| Bossaso |          | 1                         | 3                        | 2   | 68                        | 1              | 5                            |

#### 2.1.1. Stakeholder consultations

Prior to commencing field work, the Somali Institute for Environmental Peace (SIEP) communicated with government institutions at federal and regional levels. The research was executed in collaboration with the Directorate of Environment and Climate Change (DoECC). Meetings were held in-person and virtually in the period April to June with the Ministries of Environment, Agriculture and Irrigation, Livestock, Forestry and Rangelands, Planning, Commerce and Industries, and Chambers of Commerce of the states of Galmudug, Jubaland and Puntland.

Other stakeholders interviewed include East Africa University, University of Mudug, University Kismayo and NTFP collectors and traders and Kismayo customs and Port Authority.

At federal level SIEP consulted with the DoECC, Ministry of Agriculture and Irrigation, Ministry of Commerce and Industries. Ministry of Planning, Economic Development and Investment. This helped to validate research methods for data collection, indicate research site selection and hiring field assistants, clarify objectives of the study and expected outcomes.

The study areas were selected in consultation with the stakeholders, based on their local knowledge about NTFPs in the area, and local state institutions recommendations. The criteria used were the richness of NTFPs, local trade and production.



*Photo 1 : Consultation meeting with Ministry of Environment of Jubaland*

## 2.2 Key informant interviews

Interviews were held with 16 key informants: experts in the field with knowledge and experience on the subject and the study sites including population data, livelihood groups, trends on land-uses and land-use changes, land degradation, NTFPs value-chains and private sector involvements, challenges, opportunities, governance and conflict resolutions.

Nine elders were interviewed at village level taking into account security and cultural sensitivities. The field researchers explained the objectives of the research and expected outcomes and asked opinions about the research objectives.



*Photo 2 Interview with Kismayo customs and Port Authority in Kismayo*

### 2.2.1. Focus Group Discussions (FGD)

Ten FGDs were as organized with averagely 6 participants each proposed by key experts in four locations, shown in **Error! Reference source not found..**

The FGD aimed to give interviewees the chance to express themselves freely on issues under research and discuss problems and opportunities. A group discussion was organized for elders with experiences and knowledge of history of local vegetation, species identification, values and uses. This was to clarify important points and help to verify and check the accuracy and the validity of information gathered from the traders' questionnaire, key informants' interview, and the literature review.



*Photo 3 Stakeholder consultations*

### 2.2.2 Structured questionnaires

Socio-economic primary data from 403 people/householders/value chain stakeholders was collected through questionnaire using closed and open-ended questions in the period April to June 2022. These participants were purposively selected.

The participants were asked to list the types of vegetation in the area, NTFPs traded, prices at farm gate and markets, challenges and opportunities to develop NTFP value chains, woody species used in response food shortages and other house hold economic crises. The questionnaire was written and conducted in Somali language.



*Photo 4 : Structured Questionnaire interviews*

### **2.2.3 Market Survey**

Reconnaissance market surveys were carried out in Kismayo, Guriel, Garowe and Bossaso to investigate the extent forest products were commercialised. The aim was to understand products sold, analysed the value-chains and political economy of commercially important NTFPs with emphasis on products identified by the project beneficiaries, and to inform development policies and programmes. Value-chain actors in terms of harvester/collectors and traders (Wholesalers and retailers) in the three project areas were interviewed to get insight into their role as assemblers and suppliers of retailers in the areas.

### **2.2.4 Capacity Building Assessment**

Institutional capacity and training need assessment was conducted using open-ended questionnaire and key informant interviews with 25 people. The objectives of the training needs assessment were to identify existing knowledge and skills gaps in the FGS and FMS with regard to implementation of national environmental action plan in order to develop short- and long-term capacity building. During government consultations official recommended some of the relevant policies documents that need to be reviewed are included but not limited to national environmental strategy and action plan, country environmental profile, climate change projects, SWOT analysis of regulatory and institutional capacity framework such as Multilateral environmental agreements capacity, and country environmental status analysis.

### **2.2.5 Literature**

Publicly available literature such as inventories, project documents, scientific articles, reports, books and statistics, was used to substantiate the primary research data. These were obtained from institutions directly involved in natural resource management, such as government line ministries, FAO-SWALIM, the World Agroforestry Centre (ICRAF) in Kenya and internet. The DoECC shared project reports and policies.

### **2.2.6 Geospatial survey**

Satellite imagery is a good option to monitor the earth's surface cover and the ongoing changes. In this study, satellite images from the Landsat 7 ETM and Landsat 8 OLI sensors from the periods 2010 and 2022 respectively were used to produce the land cover maps. These images were acquired between the months of November and December in order to minimise cloud cover and to harmonise the different processing periods. The choice of LANDSAT imagery is explained by its historical availability in terms of image archives. Indeed, LANDSAT satellites were put into orbit from 1972 and improved over time. In addition, the choice of this spatial data was based on the 2006 IPCC Good Practice Guidance for Agriculture, Forestry and Other Land Use (AFAT), which requires the use of long-lived imagery (at least 10 years apart) and a resolution of between 30m and 100m. After pre-processing and colour compositing of images, land cover types were

visually identified based on the FAO Land Cover Classification System (LCCS) (Di Gregorio and Jansen, 2000). The image classification was based on the multi-temporal classification approach using the Envi 5.6 support vector machine (SVM) algorithm. Indeed, support vector machines or wide margin separators are a set of supervised learning techniques, designed to solve discrimination and regression problems. The post-classification operations consisted in evaluating the accuracy of the classification maps. Thus, pixel confusion matrices were developed. These matrices made it possible to determine the overall accuracy of the results obtained (total number of correctly classified pixels, Kappa coefficient) and the accuracy of each classified category, including the individual accuracy. The classification result was considered acceptable if the total number of correctly classified pixels was above 85% (Gao and Skillcorn 1998). The individual accuracies of the categories are of the same order (Anderson et al. 1971), and the Kappa coefficient should be higher than 0.80 (Tso and Mather 2001; Mather 2004). In addition, this assessment of the accuracy of the results was also based on Google Earth and Bing Map platforms which have a better spatial resolution of the order of 1.5m.

Community consultations were also carried out in the study area and vegetation cover observations at the ground level were done to complement aerial observation using remote sensing to further strengthen and increase accuracy of the analysis. Focus group discussions and key informant interviews were also used, to obtain information related to particular species exploited. Sustainable forest management requires information on the spatial distribution, composition, and structure of forests. However, in Somalia the vegetation cover in general and forest resources in particular lack detailed forest information across the country. The goal was to create a study area forest inventory (FI) map that could support strategic forest management.

### 2.3 Data Analysis

The qualitative data gathered through interviews, group discussions and market surveys were sorted and grouped in accordance with key issues and themes and analyzed using SPSS and Microsoft Excel. The results of the socio-economic questionnaire were validated and supported with the quantitative information obtained from the key informants and group discussions. Qualitative data was analysed using thematic analysis which is a method used for identifying, analysing, and reporting patterns (themes) within data. Satellite images were analysed using envi 5.3 software. The annual rate of spatial change, which expresses the proportion of each land use category that changes annually, was calculated using the following Bernier (1992) formula:

$$T = [(lnS2 - lnS1) / ((t2 - t1) \times lne)] \times 100$$

With S1 and S2: Area of a landscape unit at date t1 and t2 respectively; t2 - t1: Number of years of evolution; ln: Neperian logarithm; e: Basis of the neperian logarithm (e = 2.71828).

### 2.4 Methodological Challenges

The following challenges were faced:

- a. Security: Due to the election, security agencies imposed extra measures to prevent terrorist attacks, such as restrictions on social gathering and movement of people outside security green zones, restrictions to access Halane compound where most of the development partners are stationed.
- b. Many government officials were not available as many were contesting for parliamentary seats or campaigning.
- c. In Jubaland, women were not allowed to be part of the group discussions, and only a few accepted to be photographed during the interviews.
- d. Continuation of drought; there was no rain in the research areas. It rained a few days in parts of the country but not in the study areas
- e. Lack of national statistical data, particularly on NTFPs.

### 3. Results and Discussion

This section presents the main results in terms of the four main study aims:

1. NTFP tree producing species for agroforestry use and conservation
2. Impact of governance and political economy on the commercial viability of NTFP value chains
3. Dynamics of land use and land cover change and causes of deforestation and degradation
4. Institutional capacity gaps that influence land use changes and capacity building needs.

#### 3.1 NTFP species for agroforestry use and conservation in Somalia

##### 3.1.1 NTFP species collected

Traditional agroforestry methods in Somalia have been documented (Leslie 1991). On rainfed land scattered trees, most frequently *Dobera glabra*, are retained. These provide limited dry season browse, fruit and poles and are mainly used as shade for the farmer and his livestock. A bush fallow is often used to maintain soil fertility. On irrigated land, agricultural crops are commonly grown alongside young fruit trees until shade becomes too great. Other practices include growing crops in mature coconut plantations and with date palms. Large banana plantations are protected by sheiterbehs, predominantly of *Casuarina equisetifolia*. Attempts (with mixed success in the long term) have been made since the 1980s to introduce new practices and multipurpose species commonly used in agroforestry across Africa such as *Leucaena diversifolia*, *L. leucocephala*, *Cassia siamea*, *Gliricidia sepium*, *Casuarina equisetifolia*, *Moringa oleifera*, *Samanea saman*, *Sesbania sesba*, and *Leucaena leucocephala*. These have been in projects focusing on community forestry, woodfuel and livelihoods (Leslie 1991).

The household survey indicated the main NTFP species gathered by collectors in the states, shown in

| Scientific names NTFP species                  | Local name   | Galmudug | Puntland | Jubaland |
|------------------------------------------------|--------------|----------|----------|----------|
| 1. <i>Adansonia digitata</i>                   |              | High     | High     | High     |
| 2. <i>Ziziphus spina-christi</i>               |              | High     | High     | High     |
| 3. <i>Acacia nilotica</i>                      |              | High     | High     | High     |
| 4. <i>Balanites aegyptiaca</i> .               |              | High     | High     | High     |
| 5. <i>Cordeauxia edulis</i>                    | Yicib/Yi'ib  | High     | Medium   | Limited  |
| 6. <i>Dobera glabra</i> Forssk.                | Garas        | Medium   | Medium   | Limited  |
| 7. <i>Berchemla discolor</i> (Klotzsch) Hemsl. | Dheen        | Limited  | Limited  | High     |
| 8. <i>Ziziphus mauritiana</i> Lam              | Gob          | Limited  | High     | Limited  |
| 9. <i>Grewia penicillata</i> Chiov             | Hoohob       | High     | High     | High     |
| 10. <i>Givotia gosai</i> A.R. Smith            | Goosay       | Medium   | Medium   | High     |
| 11. <i>Acacia edgeworthii</i> T.Anderson       | Jeerin/Quule | Medium   | Medium   | Medium   |
| 12. <i>Melia volkensii</i>                     | Xar          | Limited  | Limited  | High     |
| 13. <i>Boswellia frereana</i> Birdw            | Maidi        | None     | High     | Non      |
| 14. <i>Boswellia sacra</i> Flueck.             | Moxor/Mohor  | Limited  | Limited  | High     |

|                                           |               |        |        |        |
|-------------------------------------------|---------------|--------|--------|--------|
| 15. <i>Commiphora malmal</i> (Nees) Engl. | Dhidin/Malmal | Medium | Medium | High   |
| 16. <i>Acacia senegal</i> (L.) Willd.     | Caddaad       | High   | High   | Medium |

. Most of respondents in all states gathered *Acacia senegal*, *Adansonia digitata*, *Ziziphus spina-christi*, *Acacia nilotica* and *Balanites aegyptiaca*. *Boswellia frereana* Birdw and *Boswellia sacra* Flueck, was collected exclusively in Puntland region. *Commiphora myrrha* and *Cordeauxia edulis* are more abundant in Galmudug and Jubaland regions. *Cordeauxia edulis* are more abundant in Hiiran region such as Matabaan district and Hirshabeele state and the border of Galmudug and Hirshabale state. Since community (clans) area same people, most products are transported and marketing into the Galmudug areas such as Guriceel town. During harvesting of NTFPs, collectors generally gather a range of species. Some species such as *Cordeauxia edulis*, *Commiphora malmal* (Nees) Engl. And *Acacia senegal* (L.) Willd. were frequently reported as being collected along with other species across the different states.

Table 2: NTFP species collected and perceptions of availability per state

| Scientific names NTFP species                   | Local name    | Galmudug | Puntland | Jubaland |
|-------------------------------------------------|---------------|----------|----------|----------|
| 17. <i>Adansonia digitata</i>                   |               | High     | High     | High     |
| 18. <i>Ziziphus spina-christi</i>               |               | High     | High     | High     |
| 19. <i>Acacia nilotica</i>                      |               | High     | High     | High     |
| 20. <i>Balanites aegyptiaca</i> .               |               | High     | High     | High     |
| 21. <i>Cordeauxia edulis</i>                    | Yicib/Yi'ib   | High     | Medium   | Limited  |
| 22. <i>Dobera glabra</i> Forssk.                | Garas         | Medium   | Medium   | Limited  |
| 23. <i>Berchemla discolor</i> (Klotzsch) Hemsl. | Dheen         | Limited  | Limited  | High     |
| 24. <i>Ziziphus mauritiana</i> Lam              | Gob           | Limited  | High     | Limited  |
| 25. <i>Grewia penicillata</i> Chiov             | Hoohob        | High     | High     | High     |
| 26. <i>Givotia gosai</i> A.R. Smith             | Goosay        | Medium   | Medium   | High     |
| 27. <i>Acacia edgeworthii</i> T.Anderson        | Jeerin/Quule  | Medium   | Medium   | Medium   |
| 28. <i>Melia volkensii</i>                      | Xar           | Limited  | Limited  | High     |
| 29. <i>Boswellia frereana</i> Birdw             | Maidi         | None     | High     | Non      |
| 30. <i>Boswellia sacra</i> Flueck.              | Moxor/Mohor   | Limited  | Limited  | High     |
| 31. <i>Commiphora malmal</i> (Nees) Engl.       | Dhidin/Malmal | Medium   | Medium   | High     |
| 32. <i>Acacia senegal</i> (L.) Willd.           | Caddaad       | High     | High     | Medium   |

### 3.1.2 NTFP commercialization in value chains

NTFPs plant species harvested, processed, sold and used create what is known as a value chain. Taking a chain perspective allows the impacts of governance and political economy on the trade of these products to be assessed (Kaplinsky and Morris, 2003). Different stakeholders are typically involved at each stage of the chain: small scale harvesters, traders, transporters, exporters and consumers (Ingram et al., 2012c). Most of these species are endangered due to overgrazing, charcoal production and export, and desertification resulting from erratic rainfall, possibly, due to climate change. In a context of poverty, there are economically important NTFP plant species that are suitable for the local environment that can be introduced to reap their benefit for the farming community as well as the entire population.



Photo 5 : NTFPs harvesting for household consumption

For millennia, the rural community in Somalia has been relying on NTFPs harvesting for household consumption and for cash exchange. In the last three decades, the rural community in Somalia has been challenged by prolonged conflicts, environmental degradation and climate change impacts that weakened the livelihood base and the adaptive capacity of rural households. These have increased the rural household dependence on NTFPs harvesting.

Poor households, particularly female-headed households extract a wide range of NTFPs from the forest and other woodlands to meet their basic needs for improving nutrition and household income diversification through gathering of wild fruits, leaves, roots, flowers, barks, mushrooms, bushmeat, honey, gums, resins, poles, firewood, charcoal production.

These NTFPs became highly important during the period of famine, drought, and household economic stagnation for household consumption and for trading. Some of these products have significant commercial trade values, and traded in the cash economy for centuries, i.e. Frankincense (obtained from *Boswellia* species) and myrrh (obtained from *Commiphora* species), and wild-harvested bee products.



Photo 6 : NTFP Retailer Kismayo

During the focus group discussions, the following NTFP products were proposed as being priorities for support for improved commercialization, based on the economic, environmental, and social values: *Boswellia frereana* Birdw (Maidi), *Boswellia sacra* Flueck (Moxor/Mohor), *Commiphora myrrha* (dhidin) in Puntland, and *Cordeauxia edulis* (Yicib/Yi'ib) in Galmudug and *Melia volkensii* (*Boda,baba*) in Jubaland state. Yicin and Dhidin are propagative trees which can regenerate in dryland areas. They could be used for restoration for the degraded areas through cash for work. The resins and fruits and leaves can be used as food by both human and animal. *Commiphora myrrha* is collected by unemployed young people around the urban areas. They can go to the field in the morning and collected or harvest it and return in the evening to the town for sale. Each kilogram sold around 7 to 10 dollars depend on the myrrh quality. For example, in lasanod, sool areas. There is one pilot project of the Yeheb tree in the northern region of Somalia (Somaliland). It has been observed that the benefits generated by the restoration of Yeheb and the increased biodiversity in pastoralist drylands will bring an increase sale of Yeheb seeds in local and regional markets as well as increased fodder for better dairy and meat products. Regeneration of Yeheb in the original habitats would reduce chronic food insecurity in the drought-zones. It could be part of a wider climate change adaptive strategies to bring back sustainable livelihoods for many of the pastoralist communities in the region.

### 3.1.3 Potential NTFPs for agroforestry

Elaborated in **Error! Reference source not found.**, agroforestry refers to a system where trees are managed together with crops and/or animal production systems in agricultural settings. Agroforestry focuses on the role of trees on farms and in agricultural, landscapes to meet the triple bottom line of economic, social and ecological needs. Agroforestry practices could be aimed at increasing wood production, food security, and socio-economic development and providing environmental protection.

Agroforestry beyond traditional practices is not well-developed in Somalia, and initiatives in the 1980s and 1990s appear to have largely disappeared. However, the potential of all species identified as being important for livelihoods, and in particular *Boswellia* and *Commiphora* as agroforestry trees, is high (Hassan 2020). These multipurpose agroforestry trees can aid the economic conditions of farmers and increase land productivity and counter forest degradation, droughts and over-grazing as the main factors causing land degradation. Farmers' adoption of new agroforestry management techniques in general, and those for *Boswellia* and *Commiphora* species in particular, also has a role in biodiversity conservation and climate change adaptation in the Horn of Africa, which in turn can enhance ecosystem sustainability and improve rural livelihood security and thereby facilitate poverty alleviation (Hassan 2020). The GIZ-ICRAF led

Regreening Africa project which seeks to reverse land degradation among 500,000 households, and across one million hectares in eight countries in Sub-Saharan Africa, including Somalia in Puntland and Somaliland, has already shown that by incorporating trees into croplands, communal lands and pastoral areas, regreening efforts make it possible to reclaim Africa's degraded landscapes (ICRAF 2022). Examples from the World Agroforestry Centre (ICRAF) and NGO partners using surveillance and analytical tools on land degradation dynamics (LDD) to support strategic decision-making and monitoring to scaling up agroforestry and evergreen agriculture using locally appropriate techniques including Farmer-Managed Natural Regeneration (FMNR), tree planting and other forms of agroforestry, along with the development of agroforestry value chains.

Thus, federal and state governments, donor agencies, NGOs and community leaders can do the following:

### **Policy**

- Develop and implement a national agroforestry strategy.
- Encourage a wider adoption of agroforestry at field and policy level by interacting with land users and owners.
- Promoting the use of trees outside forests and in agriculture in both forest management and agricultural policy.
- Set up and support community dialogues between policy, Research, NGOs and communities
- Strengthening community-based producer and marketing groups for priority tree-based value chains
- Facilitate 'xeer' (customary laws and practices) revitalization for resource management especially of common areas eg pasture and rangelands, forest areas.

### **Practice**

- Demonstration plots
- Training agricultural extension agents in land restoration
- Support local experiments, develop demonstration models and plots and farmer-to-farmer visits for agroforestry systems based on local NTFPs *and* appropriate exotic species, mixed with crops commonly grown and used in local agricultural and pastoralism systems.
- Encourage the planting of improved varieties of indigenous and exotic multipurpose trees that have multiple uses eg income generating, food, fodder, fuelwood and soil improvement.
- Support further value chain approach (from resource production all the way through harvest, transformation and marketing and export) oriented income generating projects, particularly on sustainable resins and woodfuel) taking market-driven, locally led tree cultivation systems.
- Support sustainable agroforestry practices by different sectors (Agriculture, forestry, development, trade), the private sector (resin exporters) and community organisations to enhance food security, rational use of resources, economic empowerment and poverty reduction.

### **Capacity**

- Build human and institutional capacity in agroforestry research and development such as curricula, practical courses and using free online resources such as from ICRAF and the Global Landscapes Forum <https://www.globallandscapesforum.org/>.
- Learn from the experience of past and recent agroforestry projects taking plot, field and landscape level approaches.
- Facilitate (eg via organisations such as ICRAF, CARE and World Vision) high-quality tree planting material available for communities

### **Box 1 : Agroforestry**

Agroforestry is “a dynamic, ecologically based, natural resource management system that, through the integration of trees in farm- and rangeland, diversifies and sustains smallholder production for increased social, economic and environmental benefits” (Leakey, 2017). Agroforestry appears as one of the alternatives that can overcome these problems. One of its functions is the diversification of food production and income (Godoy and Bawa 1993; Ambrose-Oji, 2003; Tieguhong and Zwolinsky, 2009; Mapongmetsem et al., 2010; Tieguhong et al., 2012). Trees are the main component of agroforestry system. To further attract the interest from farmers, the introduction of trees of socio-economic importance is an asset. Plants of interest are used for multiple purposes: food, medicine, energy, fertilizer and indispensable materials to manufacture commonly used tools by the populations (Kouyaté et al., 2006; Bikouel and Essomba, 2006; Fasoyiro and Degoke, 2007; Bassene, 2008; Lacombe and Aronson, 2008; FAO et al., 2012). People usually have more than subsistence income from the forest (Vedeld et al., 2007; Paumgarten, 2007; Tieguhong et al., 2009). Moreover, the traditional abusive and uncontrolled exploitation of these resources affects their regeneration possibilities and can lead to their exhaustion (Kouyaté et al., 2006).

## **3.2 Governance and political economy of NTFP value chains**

First the main NTFP value chains in the study areas are described in terms of the economics and governance, Forest governance for these purposes encompasses all interactions, both formal and informal that control how people interact in and around forests and with the products and services originating from forests. Political economy is an interdisciplinary branch of the social sciences that focuses on the interrelationships among individuals, governments, and public policy, and how economic theories such as capitalism, socialism and communism work in the real world. The failure to weigh political economy considerations has contributed to deforestation and forest degradation. Successful implementation of reforms in the forest and NTFP sectors depends upon providing the right incentives to change the behaviour of the entire spectrum of stakeholders impacted by reforms (Kishor et al., 2015). A political economy analysis of the forestry sector in Somalia will shed lights on the functioning of this complex interactions and will better equip practitioners to craft a successful reform process. Furthermore, understanding the political economy is crucial in addressing the political, economic, social and institutional contexts in which NTFPs are harvested and traded (Neumann and Hirsch, 2000). Value chains of non-timber forest products (NTFPs) originate in forests and agroforests. A value chain is about the processes, inputs, outputs and stakeholders - both direct (such as farmers, manufactures, traders, retailers and service providers) and indirect (banks, government agencies, support organisations) - involved in bringing a product from the tree and forest, through processing and production, to delivery to final consumers and ultimately disposal. The term value (or utility) denotes the value added to goods and services to enhance customer and/or societal value in this series of operations. Value however is not only the economic, monetary value added as the sequence of activities often creates a higher unit value for the processed products sold at the end of the chain – such as charcoal or gum arabic powder, than the kilo of resin at the beginning of the chain or piece of wood somewhere in the middle. Value is also socially, culturally and environmentally defined. It is the regard that something is held to deserve; its importance, worth, or usefulness. It reflects principles or standards of behaviour, and a person's or society's judgement of what is important in life. Value can be intrinsic – the value of something in and for itself, irrespective of its utility for someone else (Ingram 2014).

### 3.2.1 Firewood value chain

Fuelwood (firewood and charcoal) collection, production and sale are the major forest related income generating activities in Somalia. As over 90% of the population rely on fuelwood couple with the increasing number of households migrating from the countryside to cities business activities and number of people involved in the sector are increasing. According to the group discussion, key informants, market and household socio-economic survey, there are four main value chain groups stakeholders involved in the firewood chain:

**Lorry drivers** are better off in terms of financial capital, they own lorries for transporting and they employ people. One firewood business man in the group discussion mention that average firewood trader employs about four people, two collectors, driver and seller. Sometimes the truck owners sell the firewood in retails, but often sell to wholesalers. The target customers for this group are retailers (mainly women) and restaurant owners. The price differs across the study area; in Puntland the price of firewood/lorry is 120 USD, while in Galmudug is 150 and Jubaland is 80 USD. A long-time female firewood seller explained how she sells firewood. After buying, the firewood is commonly stored in an open space, and then the logs are sorted, chopping the poles to the required size and organised in bundles. An average lorry of firewood can be about 60 bundles. Depending on the species, a bundle of energy efficient species cost about 3 USD. Therefore, a firewood retailer can make up to 60 USD/lorry of firewood sold. Table 1 shows the list of preferred species for firewood use.



Photo 7 Lorry transport of firewood

Donkey cart owners are the main suppliers of firewood consumed by households. One respondent from Guriel district in Galmudug said that the number of households that make their living from firewood collection can be upto 100 donkey cart owners. One particular donkey cart owner said “we are many, some of us own the cart, while others may rent”. When asked about the profitability of firewood collection by using donkey cart transportation, all respondents from the three study areas emphasized about the intensity of the work associated with firewood collection. Commercial firewood collection is only a man business in Somalia, because of security risks. “Dry logs used to be available nearby, but now we have to go far into remote areas, sometimes we cross the border into Ethiopia side and spend days in the forest”, said one firewood collector. He further said, we “we borrow sugar, tea, rice and cooking oil from shop”. The price of a load of donkey cart also differs in the three project areas; In Jubaland, one donkey cart costs about 15.5 USD, in Puntland is about 20 USD and Galmudug is about, 25 USD.



Photo 8 Donkey cart owner bringing firewood into Addado district

The price is not fixed, and often negotiated. When asked why Galmudug, firewood logs are expensive compared to other two states, one key informant said “because the wood is scarce in Galmudug. According to information obtained during the key informant interviews and group discussions, an average firewood collector using donkey cart can bring firewood to the market, about six times in Jubaland, four times in Puntland and 3 three times in Galmudug per month.

**Pastoralists** are one of the main groups collecting firewood for sale. They gather dry wood during animal herding and grazing and bring into market to make supplementary income from the sale of the logs.

**Table 3: List of preferred local species for firewood Use**

| Botanical names         | Local names   | Reason for Preferences | Ranking   |
|-------------------------|---------------|------------------------|-----------|
| <i>Acacia Busei</i>     | Galool        | Energy efficiency      | Excellent |
| <i>Acacia tortilis</i>  | Qurac/Qu'ra   | Energy efficiency      | Very good |
| <i>Acacia Reficiens</i> | Qasax/Qasah   | Energy efficiency      | Very good |
| <i>Acacia senegal</i>   | Caddaad/Addad | Energy efficiency      | Very good |

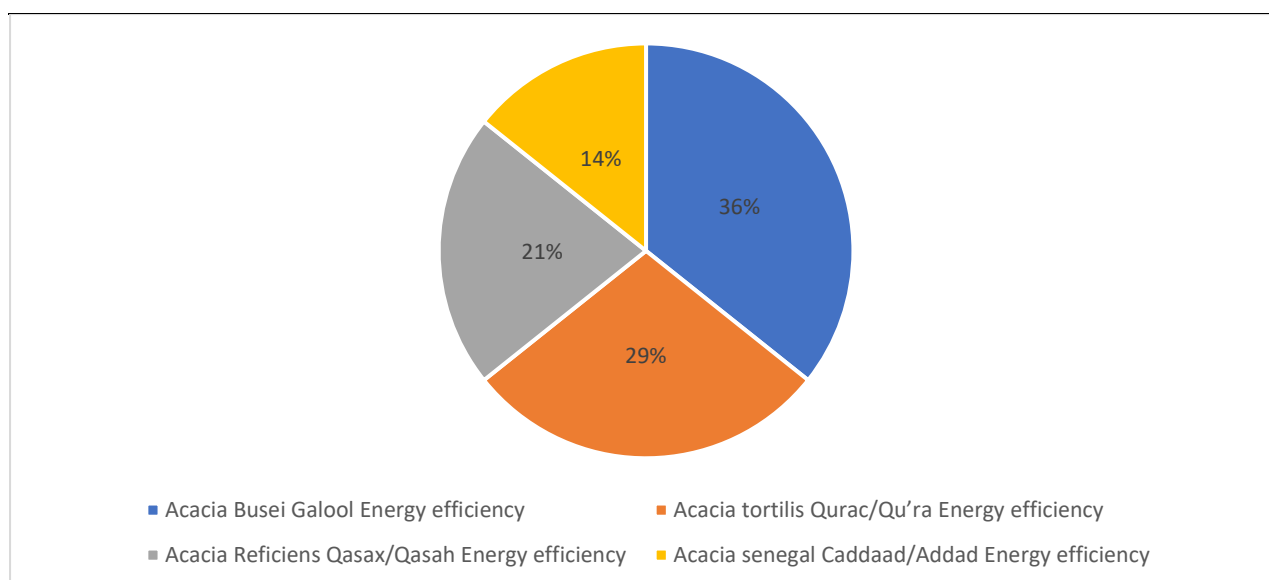


Figure 3: Ranking of energy efficiency of acacia species

### 3.2.2 Yi'ib nut value chain

*Cordeauxia edulis* nuts are highly nutritious and are collected and consumed as a staple food by pastoralists and sold both in the local markets and parts of the country. *Cordeauxia edulis* is a multi-stemmed evergreen shrub endemic to eastern Ethiopia and central Somalia. During the devastating Sahelian drought in 1974 yehib nuts were among the few foods that were available in the market (Ali 1988, Pay Drechsel, & Zech, 1988, Yusuf et al. 2013). Women travel in groups to the forest and spend over a week to collect Ye'ib nuts. As seen in figure 9, a women selling Yi'ib nuts on the street as retailer, about 250 g of Ye'ib nuts costs 3 US dollars. It is hard to quantify the amount of this NTFP gathered annually or sold, as most of the products are obtained from the environment and then consumed at household level.

The sector is informal, the chain opaque and closed. There has been very little traceability or ability to know how or where the nuts are produced; this created a situation where exploitation could run rampant and there was no ability to monitor the Yicib and other frankincense forest health. Harvesters have been offered rock-bottom prices, with middlemen (paramilitias) siphoning off most of the value and communities receiving no investment, trapping them in poverty and forcing them to harvest as much as possible every season. Companies have often found it easier to ignore or greenwash the situation. The study is recommended to be conducted to monitor the use of this species of NTFP trees in the study states. Education and awareness programmes should be launched for local communities to increase the knowledge of the rarity of this plant and to encourage sustainable harvesting of the seeds. Existing populations should be protected. Plantations could be created as a sustainable source of seeds. Mostly these fruits are locally traded and used, international

trade may exacerbate these endangered species. After harvesting, the local community collectors must be fairly paid in order to empower them and help them seek at developing alternative, sustainable revenue streams not only directly dependent on these trees.

### 3.2.3 Frankincense and myrrh aromatic resin value chains

Frankincense and myrrh are aromatic resins obtained from *Boswellia frereana*, *Boswellia sacra* (frankincense) and *Commiphora myrrha* (myrrh). These trees are endemic to the mountain areas of Sanaag and Bari regions. The trees that produce these products are for the most part confined to the mountain areas of Sanaag, and Bari although some species are cultivated. Two types of commercial frankincense are collected, usually during the hot season (xagaa): “maydi” (*Boswellia frereana*) from “yagcar” trees which are tapped over a nine-month period, peaking in October. “beeyo” is collected from “moxor” trees (*Boswellia sacra*), and is tapped twice a year, at intervals of up to 25 days over a two-to-three-month period. The biggest market for these products is in Bosaso, Qardho, and Erigavo cities. The roads are rocky and very bad to access. In Puntland, the collectors of frankincense and myrrh are estimated from 7000 to 10,000. While buyers or traders are estimated around 300 individuals.

The resins are exported to United Arabs Emirates and Arabic countries, and to France (Europe). Both men and women are involved in this business sector; men are the harvesters, and women are responsible for sorting, cleaning and packaging although they benefit the least. These NTFPs contributes significantly to job creation in the rural community and urban dwellers through the harvesting, sorting, transportation and cleaning of the products. For cleaning and sorting more than 3,000 women are being employed during this stage while men are involving collection, transportation and packaging.

Although frankincense and the other resins are not as important as livestock and its by-products, they contribute a substantial share to the total exports and rural community livelihoods. In 2020, Somalia exported \$ 25.8 M in Resins, making it the 8<sup>th</sup> largest exporter of Resins in the world. In the same year, Resins was the 3<sup>rd</sup> most exported product in Somalia. Total frankincense exports vary annually. In 2017, approximately 40% of the commodity was harvested, roughly 500 metric tons per year in Puntland. Unfortunately, no official reports about these NTFP in the country exist. Exports were reported to have been increasing rapidly. The average price per kilogramme of *Boswellia frereana* pure resins and *Commiphora* gums are 18 and 30 USD respectively.

76 % of the respondents indicated that there has been a decline in the production of these NTFPs due to drought, climate change effects and poor harvesting techniques. Notwithstanding, the demand for these NTFPs has increased as well as the numbers of interested stakeholders.

Figures 5 and 6 present an approach to develop *Commiphora* gums and *Boswellia frereana* value chains . Based on the stakeholder analysis the following institutions are identified as important *supporters*:

- Ministry of Livestock, Forestry and Ranges (MLFR);
- DoECC (federal) and Ministries of Environment at State level;
- Ministries of Labour (ML);
- Ministry of women and human rights (MWHR); Ministry of humanitarian and disaster management (MHDM).

The following institutions could act as *enablers* of these value chains:

- Ministries of Agriculture and Irrigation (MAI);
- Ministries of Planning (MP);
- Ministries of Finance (MF);
- Ministry of Education (ME);
- Ministry of Commerce and Industry (MCI);

- Ministry of Information (MI);
- The Somali Chamber of Commerce, Industry and Agriculture;
- NGOs, Academic and Research institutions;
- Financial institutions in Somalia.

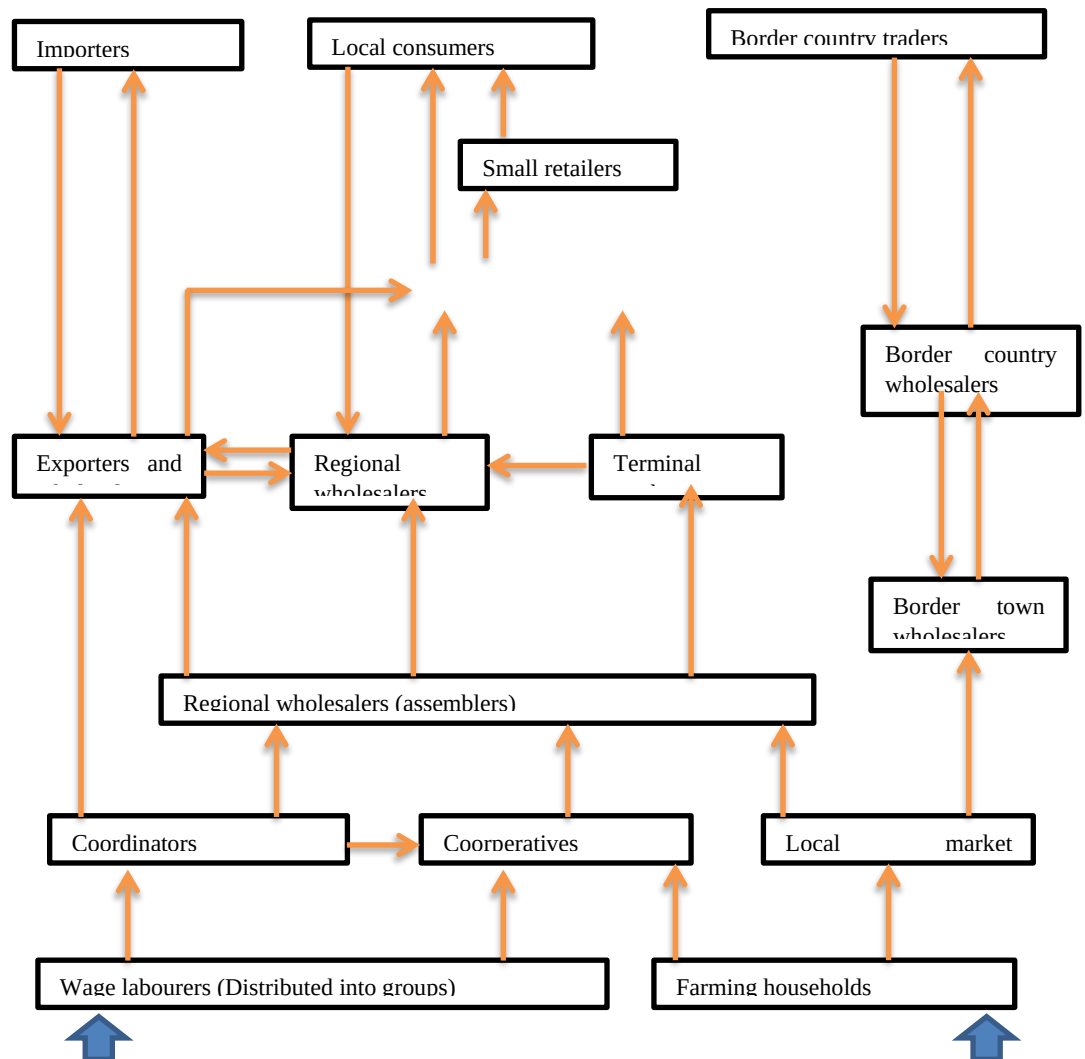


Figure 5 : Proposed Value chain development for Commiphora gum

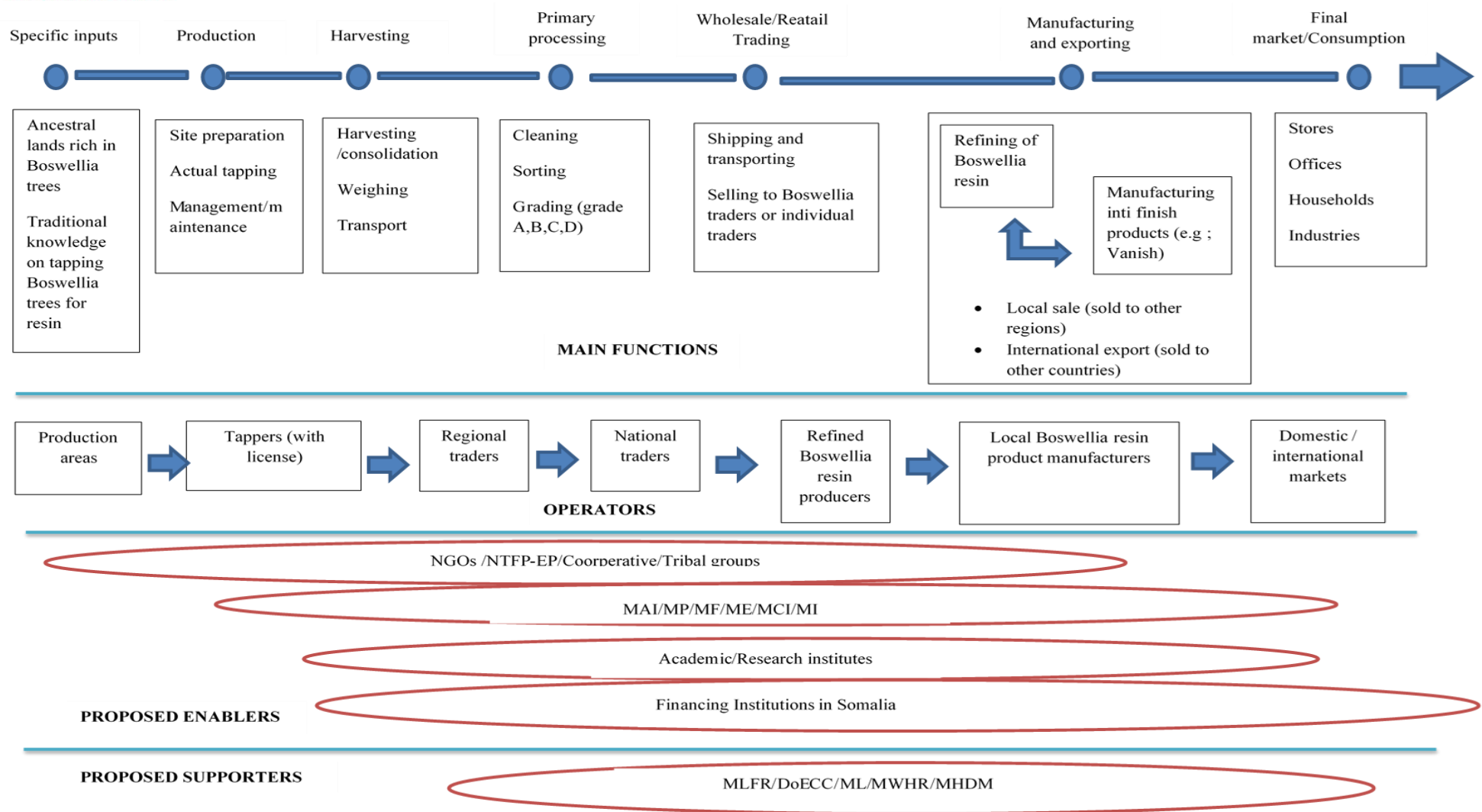


Figure 4: Proposed strategy for development of *Boswellia frereania chian* in somalia

Table 4: List of NTFPs collected and used as food and for income generation in Somalia

| No. | Botanical names of NTFP Species             | Local names  | Galmudug    |      | Jubaland    |      | Puntland    |      |  | Other uses                                                                                                                                                   |
|-----|---------------------------------------------|--------------|-------------|------|-------------|------|-------------|------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     |                                             |              | Food        | sale | Food        | sale | Food        | Sale |  |                                                                                                                                                              |
| 1   | <i>Cordeauxia edulis</i>                    | Yicib/Yi'ib  | food        | sale | -           | -    | food        | sale |  | Fruits are used for food, leaves for fodder and branches for construction.                                                                                   |
| 2   | <i>Dobera glabra</i> Forssk.                | Garas        | Famine Food | -    | famine food | -    | famine food | -    |  | Drought fodder, wood is used to make mortars and pestles; beehives.                                                                                          |
| 3   | <i>Berchemla discolor</i> (Klotzsch) Hemsl. | Dheen        | food        | Sale | Food        | Sale | Food        | Sale |  | Fruits are used for food; leaves for fodder and medicine; wood for construction and walking cane                                                             |
| 4   | <i>Ziziphus mauritiana</i> Lam              | Gob          | Food        | Sale | Food        | Sale | Food        | Sale |  | Fodder, fence, cosmetics, medicine and construction                                                                                                          |
| 5   | <i>Grewia penicillata</i> Chiov             | Hoohob       | Food        | Sale | Food        | Sale | Food        | Sale |  | Fodder and construction of hut house                                                                                                                         |
| 6   | <i>Givotia gosai</i> A.R. Smith             | Goosay       | Food        | Sale | -           | -    | Food        | Sale |  | The fruits are nutritionally very important; local people eat them during famine. The fruits ripen during the dry season, both the pulp and seeds are eaten. |
| 7   | <i>Acacia edgeworthii</i> T.Anderson        | Jeerin/Quule | Food        | Sale | -           | -    | -           | -    |  | fodder and for medicine; branches are used for fencing. Seeds are used for food and medicine, pod husks used for animal feed.                                |
| 8   | <i>Melia volkensii</i>                      | Xar          |             |      |             | Sale |             |      |  | Leaves are good sources of fodder and wood used for boat construction                                                                                        |

|    |                                          |               |      |      |      |      |      |      |  |                                                                                     |
|----|------------------------------------------|---------------|------|------|------|------|------|------|--|-------------------------------------------------------------------------------------|
| 9  | <i>Boswellia frereana</i><br>Birdw       | Maidi         | -    | -    | -    | -    | -    | Sale |  | Resin for cash exchange, leaves for fodder during the dry season                    |
| 10 | <i>Boswellia sacra</i><br>Flueck.        | Moxor/Mohor   | -    | -    | -    | -    | -    | Sale |  | Resin for cash exchange, leaves for fodder during the dry season                    |
| 11 | <i>Commiphora malmal</i><br>(Nees) Engl. | Dhidin/Malmal | -    | Sale | -    | Sale | -    | Sale |  | Resin (myrrh) for cash exchange, dry leaves for animal feed and medicines.          |
| 12 | <i>Acacia senegal (L.)</i><br>Willd.     | Caddaad       | Food | Sale | Food | Sale | food | Sale |  | Gums are eaten, sold for cash, fodder, firewood, charcoal, dead fencing, bee forage |

### 3.2.4 Gender impact

Ninety nine percent of the locally traded NTFPs market chain in all three study areas were dominated by women. Even though the market for these products remains underdeveloped, female headed households make their living by selling different NTFPs such as firewood, charcoal, wild fruits, and other products used for cosmetics and medicinal. In Puntland, the highly commercialized frankincense value-chain, cleaning and sorting sector is also generally female dominated, while other sectors i.e. harvesting, transporting, and exporting are male dominated.



Photo 9 NTFPs production processing and retail

The distribution of men and women in the sample of the NTFP collectors was slightly gender unbalanced (male-female = 61%/39%). This could be explained by the participation of both genders in collecting NTFPs in the study area. Respondents indicated that men are more involved in the collection of NTFPs that takes more physical strength (e.g. tapping and collection of *Acacia senegal*) and women are more active than men in collecting NTFPs that require more agility (e.g. collecting fruit from *Zizyphus spina-christi* and *Balanites aegyptiaca*).

Regarding trade, the gender distribution among the traders' sample revealed an imbalanced percentage favouring male over female (85%:15%). This gender imbalance may arise as a consequence of various factors including the non-existence of women at the main urban and central crop markets (e.g. Bossaso market of Puntland state and Guriel Market of Galmudug state) and as women are very involved at rural markets or marginal markets in big cities (e.g. Ufayn district in Puntland and Cadaado in Galmudug region). The gender distribution pertinent to NTFP processing activities was generally female-dominated (male:female = 90%:10%). This is explained as most NTFP processing activities is conducted by women. Although women are active workers at the processing units, they are not allowed to disclose information or to participate in a study in the presence of men who are always the owners of the business.

Table 5: Gender distribution across different sample of targeted group

| Gender | Collector |    | Trader    |    | Processor |    |
|--------|-----------|----|-----------|----|-----------|----|
|        | Frequency | %  | Frequency | %  | Frequency | %  |
| Male   | 82        | 61 | 115       | 85 | 121       | 90 |
| Female | 53        | 39 | 20        | 15 | 14        | 10 |
| Total  | 133       |    | 135       |    | 135       |    |

### 3.2.5 NTFPs for subsistence use

As well as being traded, NTFPs serve as food and for the rural populations in the study area. Survey results confirm the existence of many NTFP food and commercial species as shown in Table 2. NTFP species have food values and 8 have commercial values. NTFPs occupy an important place in the lives of the local people both in season and during times of food shortage.

### 3.2.6 Household socio-economic Characteristics

Generally, livestock rearing, small-scale subsistence crop farming and harvesting of NTFPs are principal sources of livelihoods of the population in the three study areas. Other sources of income are petty trading, informal employment and white-collar jobs. The pastoral households in the study areas practice seasonal migration to access pasture, settling near to water sources and good pasture for a few weeks before moving on. Those who are unable to travel long distances, particularly women, children, elderly and the sick people are left behind and settle in the outskirts of the cities. As a result of continuous drought events in the Horn of Africa, a large number of pastoral households lost their livestock, and became Internally Displaced Persons (IDPs) dependent on humanitarian food assistances, NTFPs and informal employment.



Photo 10 : Street vendor of Yi'ib nuts (*Cordeauxia edulis*)

Occupations and associated total annual household income levels of respondents varied greatly between different categories in the study areas. From the economic related information of respondents, there were various categories of alternative livelihoods and sources of income. Although the relatively small sample size of the study limits the extent to which the findings can be taken as genuinely representative of all parts of the target areas.

The respondents indicated that approximately 60% of the interviewees rely on pastoralism in Puntland and Galmudug regions while in Jubaland 40% indicate agro-pastoralism as their main source of income, with NTFPs a second source of income in all the regions, with households in Jubaland having the highest reliance (30% of the interviewees) followed by those in Puntland (22%) and Galmudug (20%).

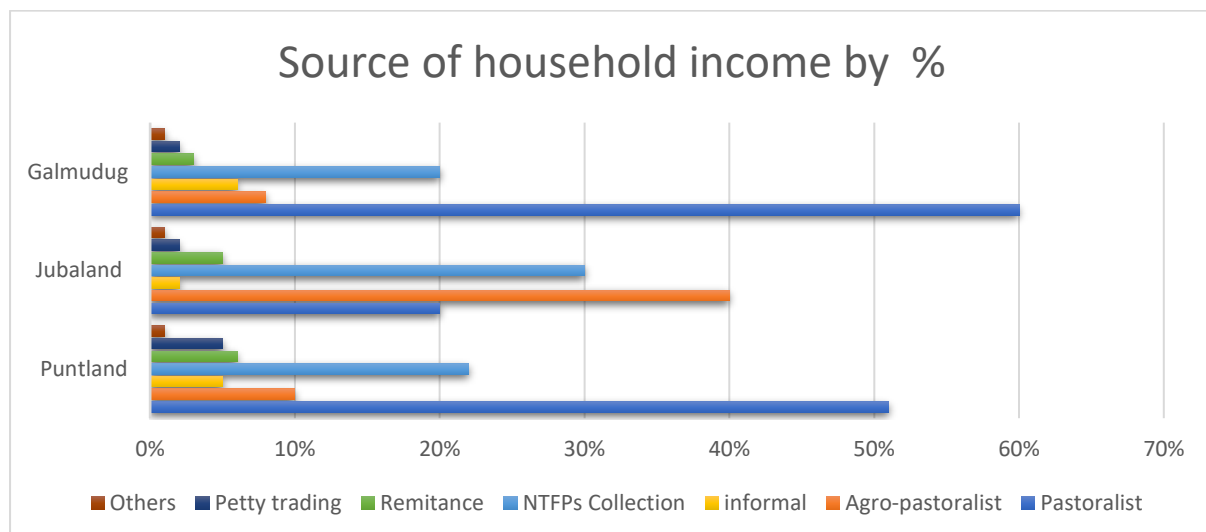


Figure 5: Main sources of household income

Pastoralism and agro-pastoralism were the main sources of household income in the project areas. Despite of the fragile ecosystems of the area, results revealed that woody plants and woodlands constituted other important sources of household income including; essential goods and services, income, employment, and capital.

Information obtained from key informants and group discussion differentiate the small trading business from other informal employment activities. Although the communities continued to rely on livestock production, it was realized that communities lacked diversity in utilization patterns and technologies for promoting multi-production systems.

Informal employment was also noted as a major means of household income. A possible explanation is that some of the project areas notably Galmudug and Puntland are close to the borders of Somalia and Ethiopia (Ogaden region), therefore, there are potential markets and people are trading between the borders. Other important source of household income as indicated by the respondents was remittance. This is due to the fact that at least one member of every household is living outside the country and send some money back to his/her family on monthly basis or periodically.

### 3.2.7 Socio-economic and ecological benefits of NTFPs

NTFPs can provide small or substantial economic contribution to rural livelihood, especially in poor households. Sixty five percent of households interviewed indicated that NTFPs from the forest and other woodlands are used for subsistence needs, with 30% sold for cash and 5% having other benefits and uses.

Both during the rainy and dry seasons the forest and other woodlands provide cash income and supplementary food, collected as pass by or intentionally. Some of the NTFPs are integrated into the cash economy as an economic safety net, for example, products such as aromatic resins, wild harvested honey and Yi'ib nuts are good example of seasonal income generating NTFPs.

The majority of the households and individuals involved in the value-chains of NTFPs; harvesting, transport, processing, storage, and marketing in the study areas are predominately poor households particularly women headed households.

The age distribution of the three actors categories (collectors, traders and processors) shows that the '41-50 years age group constitute the largest percentage (46 percent) in Jubaland, following Puntland 34 percent and 30 percent in Galmudug. For NTFP collectors in all states, whereas the '21–30 years' age group was hardly represented in Puntland and Galmudug. The majority (90 percent) of NTFP actors interviewed are 50 or older.

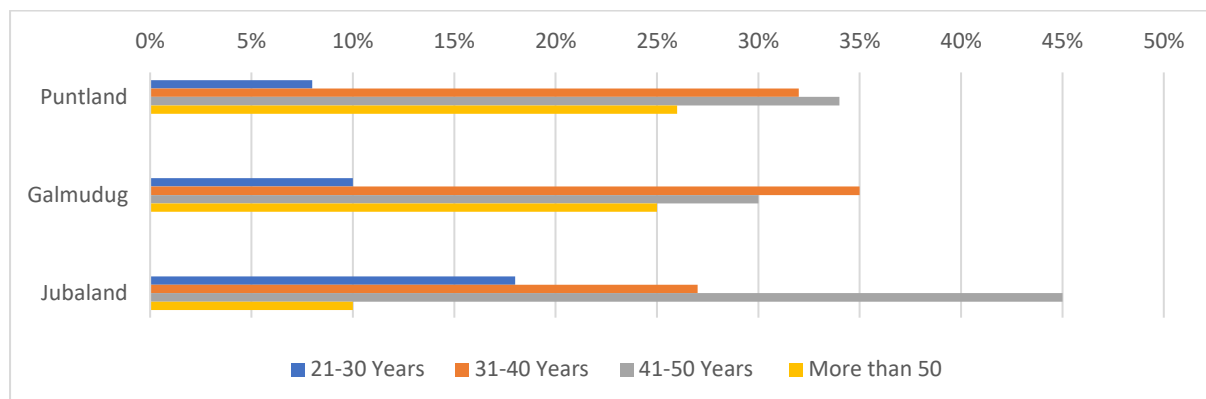


Figure 6: Age Groups of NTFP stakeholders interviewed per state

NTFP actors in the start of the chain showed high levels of informal education with the majority of collectors (61%) and processors (77 %) having no education and a moderate percentage of traders (25%). A high percentage of NTFP traders reported having a secondary education (34 %), while a very low percentage (3%) reported having a university education, with no processors and collectors having university level education.

Table 6: Table 6: Educational Status NTFP Value Chain Stakeholders

| Educational status | None | Primary | Secondary | University |
|--------------------|------|---------|-----------|------------|
| Collectors         | 61%  | 29%     | 10%       | 0%         |
| Traders            | 25%  | 38%     | 34%       | 3%         |
| Processors         | 77%  | 23%     | 0%        | 0%         |

The majority of the NTFP actors studied are married while the minority (28 percent) are single very high percentages of respondents in Jubaland and are married compared to Puntland where there are more single respondents, influenced by economic and cultural practices towards marriage, as the southern part of the country (Jubaland) practices early marriage compared to Puntland state, The result highlights the status of family stability in most of the NTFP collection areas across the states.

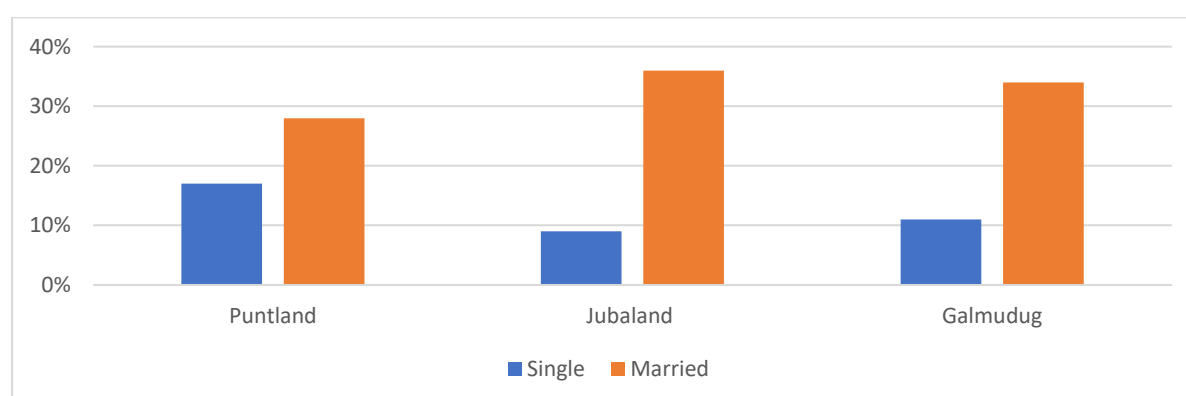


Figure 7: Marital Status of NTFP Stakeholders in Value Chain

### 3.3 Governance regimes of NTFP resources

#### 3.3.1 Local community customary governance

Communities play a key role in the management of the forestry sector including the governance and utilization of NTFPs. Local communities (led by traditional leaders), spearhead planning and management of forests and investment in forestry at local levels. They are also the implementers and the determinants of tree species and technologies used in community-based forestry plantation establishment and management and do and can play a key role in enhancement of NTFPs.

Although the Somalian constitution indicates that land belongs to the government, practically clans administer land in the areas they live under a communal system. In the past, the influence of the tribe and its subdivisions have come about either by natural agreement or boundaries. In most cases village leaders have the right to allocate land within their tribal lands and the tribal chiefs (*Nabadoono*) have established traditional rules to organize land tenure.

This study found that tribal leaders, local community, landlords (owners) and both tribal leaders and the government authority - mainly the local authority- are involved, with varying degrees of authority.

Rights to harvest NTFPs across differ depending on state and tree species. Families owning plantations cultivate and harvest on a rotating basis (*Gaafeyisi*). individuals pay rent (*Cawaaji*) to families owning

plantations and collect the production for the entire season. Two types of commercial frankincense are collected. Maydi (*Boswellia Frereania*) from yagcar trees and beeyo (*Bowellia Sacra*) from Moxor trees. Maydi frankincense is exclusive to Somalia, while beeyo frankincense, varying in variety, is produced in Ethiopia (Region Five), Eritrea, Oman and India. In regards of the other trees identified are open access growing grazing land areas and no one owns. As they mostly grow in grazing land, they can typically be harvested by anyone who is local to that area and has the inclination to do so. Often, harvesters of frankincense will harvest myrrh as well during the off-season for frankincense. While this kind of open-access system generally causes sustainability concerns, the market for myrrh is small enough relative to the number of trees that there has been little overharvesting. Other key problems faced by *Commiphora myrrha* and *Cordeauxia edulis* are clearance for farms and to create livestock fences.

For trees owned by individuals or families, the boundaries of each farm are not marked or written down, but are well-known to each harvester. However, conflict do happen due to a lack of delineation of the trees. it has been recommended to do some of the first mappings to delineate and monitor each farm source It is therefore critically important to have a strategic plan to continuously monitor the trees from which we get our resin, work with the harvesters to ensure that they are being paid fairly and can provide for their families, and help support the harvesting communities to develop sustainably. In order to overcome and minimize the overharvesting of this tree, there is a need to develop a comprehensive Harvesting Sustainability Plan both owned NTFP and on open access. The good time for harvesting is in autumn or the dry season, this is when the resins are freshest and the essential oil yield is highest. Working alongside family members and local people in order to focus on supporting community-created and driven development and overcome middlemen barriers in the VC. Investors also do training to help educate and develop a better understanding of the relationship between sustainable harvesting and the long-term future of the trees. Appropriate investments such as harvesting tools to help make the work safer more efficient and accessible. Projects and studies conducted have recognized that Through training and education program helped preventing harm to existing trees and actively encouraged regeneration. Developing initiatives by creating locally appropriate adaptive management plans to monitor the health of the trees and ensure their long-term viability.

Shown in **Error! Reference source not found.**, different methods are used to obtain the right to harvest NTFP lands across the study area, include inheritance, benefit sharing, land use and purchasing the land.

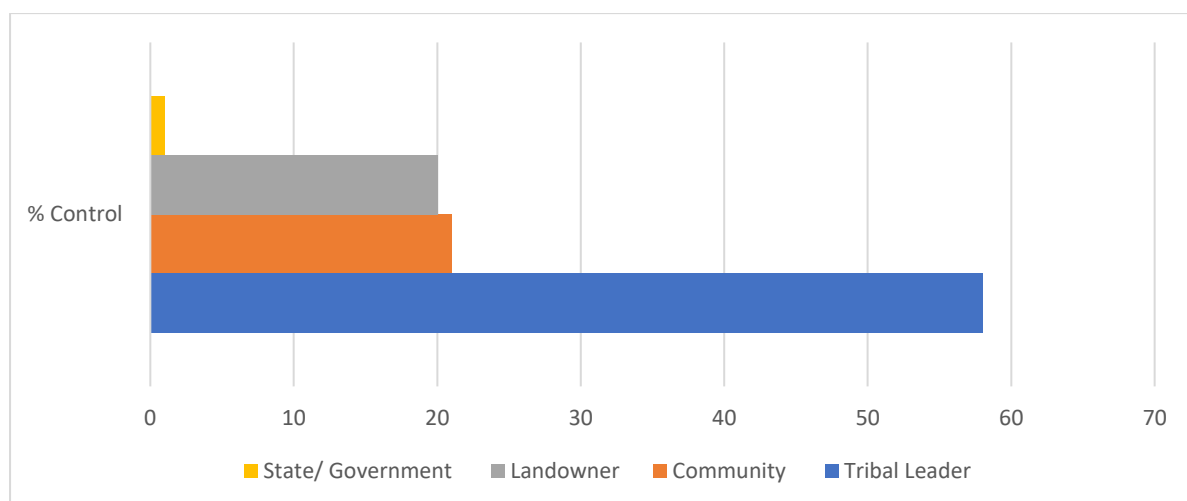


Figure 8: Entities Controlling NTFPs on Communal Land

Economically important NTFP trees are registered property (with the elders' council and sometimes may be registered in the name of an owning family) and are inherited from generation to generation.

The frankincense is usually used, in addition to religious rites, in the cosmetic industries, where it is an essential oil because of its clear and aromatic properties.

Important indigenous forest exports include frankincense from *Boswellia* species growing in the Sanaag and Bari region of Puntland. These are highly prized trees with tree tenure systems given to individual persons, and controlled by the elders' council, *Commiphora* species and gum Arabic from *Acacia senegalensis* in Nugaal, Mudug and Sanaag regions, and *Cordeauxia edulis*, seen as endangered in Mudug region. Although they are not felled for charcoal or other uses, natural regeneration of *Boswellia* is threatened by over-grazing.

The production of frankincense is confined to a narrow mountainous strip overlooking the Red Sea. The main collection centers are towns in and around the coast. Frankincense and Myrrh are collected from natural *Commiphora* and *Boswellia* trees in the Bari region of Puntland. Although this is subsidiary to herding, the collection is a vital mainstay of the local economy in certain regions in northern Somalia. For many collectors, it is the principal source of income.

### **3.3.1 Federal Government**

The Central government has an overall responsibility to coordinate inter-ministerial issues in the forestry sector, developing and ensuring that the forestry policy implementation. The Directorate of Environment and Climate Change under the Office of the Prime Minister (or Ministry of Environment) shall have the overall national responsibility for forest resources development including NTFPs. The role of the Directorate or Ministry of Environment is to formulate and review national policies and coordinate their implementation.

### **3.3.2 Federal Member States**

The main responsibility of the state government is to ensure that orientations, guidance from the central level are internalized and that national policies (e.g. National Forestry Policy, Charcoal Policy etc) are implemented at state level. They are also responsible to manage the state forests in collaboration with local governments, NGOs, Communities and private sector.

### **3.3.3 Private Sector**

Most commercial activities in forestry are handled by the private sector. However, the enabling environment created by the government for private sector to do business, invest and participate in forestry and forest industries development is very low. Somalia is ranked 190 among 190 economies in the ease of doing business, according to the latest World Bank annual ratings, unchanged since 2018. Potential areas of intervention by the private sector include investment in enhancing NTFPs commercialization (e.g. investment from private banks), harvesting and marketing of forest products, plantations especially on degraded lands, agroforestry models and demonstration farms, forest and tree based small-scale enterprise development, and the development of sustainable forest management systems, given similar examples in Cameroon (Awono et al 2013), Cape Verde (Ingram 2022) and globally (Darr et al 2020). Currently such investment and collaboration does not exist and it is an area with huge potential for development if the private sector or public-private partnerships could be encouraged to increase investment in forestry and agroforest sector. Similar challenges have been identified globally by Meinhold and Darr (2019): lack of resource access (finances, skills, technologies, etc.), market information, and basic infrastructure; the role of key entrepreneurs; and cooperation across the value chain, amongst producers, and among members of institutional environments or in an abundant resource base. Moving from small-scale NTFP commercialization in local markets to reach export markets, requires increasing cooperation and a supportive institutional framework. Overall, successful NTFP processing strongly depends on the socio-economic and environmental context in question, requiring a holistic approach tailored to the respective context and value chains.

### 3.3.4 Governance challenges in NTFP value chains

NTFPs are commonly harvested from the natural vegetation, and they can be sustainable or destructive depending on the tools and techniques used, and part of the plant harvested. The uses of natural forests for making traditional medicines (such as ginseng species in Galgala region near Bossaso are well documented. It involves the use of different parts of the herbs, such as the roots, leaves, pods, resins, fruits, etc. In Somalia, people have always used traditional medicines to treat a wide range of illnesses. The introduction of modern medicines, such as antibiotics, has not stopped the use of medicinal plants. The indigenous tree species are widely used in Somalia for the treatment of a range of bacterial and viral diseases, as well as skin wounds, insect bites, etc.

Almost all of the identified NTFPs producing species with commercial viability and potential for socio-economic development are mostly slow growing species that may take several years to reach maturity i.e. *Boswellia* and *Commiphora* species. Therefore, as the number of households depending on NTFPs increases, pressure on vegetation is expected to intensify, leading to resource depletion and over-exploitation.

This particularly endangers endemic species such as *Cordeauxia edulis* (syn. Gut or Ye'ib) and the endangered is *Melia volkensii* (a source of hardwood used for boat construction) found only in the southern tip of Jubaland close to the border of Kenya. *Melia volkensii* has difficulties to regenerate naturally without seed treatment because of seed hard coats. Traditional tapping techniques of *Boswellia* and *Commiphora* species to exude aromatic resins affects the productivity and the lifespan of the trees. Wild honey bees make hives in natural hollows in tree trunks, therefore, wild-honey hunters use unsustainable aggressive method that affect the trees or even some times they may cut the trees.



Photo 11: *Cordeauxia edulis* (Ye'ib shrub) at the border of Galmudug and Puntland, near Ethiopia

### 3.4. Political economy of NTFPs

Power and resources are distributed in Somalia among a range of formal and informal, domestic and international actors. These actors operate in various contexts, with differing consequences on forests and the non-timber forest products. Political economy analysis is aimed at shedding light on the interests, incentives and institutions linked to these actors that may enable or challenge the sustainable management of forests on which NTFP value chains are based as well as on livelihood improvement.

In terms of politics, domestic and international informal interest groups (clans, Islamic extremist groups, religious groups, and the diaspora) have competing claims over rights and resources with formal interest groups, largely the Somali Federal Government (SFG) and the regional federal states. Overall, the power of the formal regional and SFG is weak; and with the majority of the Lower House representatives coming from the diaspora (Webersik et al., 2018) who may not have a stake in the sustainable management of forest resources. Real power lies with individuals, powerful clan militias, and Al-Shabaab, who control the sub-contracts for development support necessary for creating an enabling environment for value chain development, export business, and illicit trans-border trade of forest products especially to gulf countries and the revenues thereof used to fuel conflict. There is a dismal history of resource over-exploitation for personal or clan-based gains. The most rapid degradation has been of forest resources that provide the raw material for the production of charcoal in Somalia – extracted predominantly from slow growing dry deciduous land and thicket species of *Acacia* and *Commiphora*. Another source of revenue is the informal tax which the warlords levy on these

products, people and carriers transiting the borders. In Somali society, pastoral lands have always been deemed a common good – range land is claimed by clans and not individuals so land conflicts in the pastoral setting are usually matters of power struggles between two clans. In cases where one clan gains an upper hand, neighboring clans can be pushed out of prime range land and lose access to their own natural resources. The civil war and state collapse accelerated the struggle for land, replacing title deeds (and traditional mechanisms of land allocations) with the use of semi-automatic weapons as an instrument of choice for appropriating land from weaker groups. For example, land grabbing in the 1990s did not involve militia taking up land-based livelihoods themselves, which is seen as a low-status occupation, but instead involved laying claim to harvests (UNDP, 1998). This practice is also evident in the production and trade of charcoal. The influential traders and militia groups do not engage in the charcoal production process, but instead act as intermediaries in the charcoal value chain in order to extort income. The hard labour, local selling and distribution are carried out by the poorer members of society who are considered to be of low status in Somali society. For a bag (25-30kg) of charcoal that sells at USD 12 in the Middle East, only USD 1-2 is paid to the labourer producing the charcoal, while the balance is shared by the traders, militia groups and transporters. Similarly, only USD 2 to 3 is shared between the producer and vendor (generally women) for a bag of charcoal that is sold at USD 8 in the local markets of Somalia.

The economic processes that create revenue and improve the livelihoods of the local actors involved in the value chain of NTFPs are linked to how political decisions are made. Trade in NTFPs in Somalia is significantly influenced by political outcomes (Webersik et al., 2018). The private sector benefits considerably from the absence of rule of law in some areas in Galmudug and Jubaland but they are also willing to pay informal taxes (which does not go into government coffers) for trade in forest resources and for the security of their economic operations. This is money the government could use to re-invest in the development of the forestry sector as is done in other countries with a strong government. Political offices generally and particularly those in the various sectors responsible for the protection and sustainable management of forests are largely used as means to create wealth rather than to pursue the missions and mandates of their institutions. This has created a dynamic that undermines the development of the NTFP sector with widespread corruption. As a result, there is a strong interrelationship between representatives of formal organizations and informal actors. Political actors and private entrepreneurs who have access to funds are targeted by al-Shabaab. Any potential security threat is an instrument for paid protection (Menkhaus, 2016). Somalia's war economy has therefore created insecurity in the country and an elite of business people, warlords, politicians, and religious leaders, all benefiting from insecurity. It is difficult to carry out significant business or service provision in the NTFP sector without paying protection money to powerful clan paramilitaries. A stable, functioning national, regional and local administration which is prerequisite for the successful implementation of policies and practices for the sustainable exploitation and trade of NTFPs is not in the interest of these elites as that would undermine their own businesses which is sustained by insecurity (Webersik et al., 2018). Traders of NTFPs like frankincense and myrrh suffer from insecurity and conflicts, as they have to pay bribes and protection money for security, and risk their lives while doing business. This limits their ability to add value and limits their ability to generate regular household income.

Apart from domestic actors, regional and international formal and informal actors with vested interests have contributed to conflict, deforestation and forest degradation in Somalia. For example, the tendency of Gulf Cooperation Council (GCC) states such as Saudi Arabia, Qatar and the United Arab Emirates to illicitly buy Somalia's charcoal for their own domestic use. International actors on the other hand, such as the African Union, the United Nations, International Organizations, individual nation states, or supranational institutions like the European Union, need recognized governments to work with. This

affects how the international community addresses politics and the sustainable exploitation and trade of forest resources and NTFPs. For example, a 2012 UN Security Council resolution banned the importation of Somali charcoal. However, due to interests of the other informal actors and weak capacity for implementation by the Somali government, the last few decades have seen an increase in unsustainable charcoal production and export. The role of government in managing conflicts, especially the federal government is critical. Sumra and Almi (2020) of the previous report that conflict resolutions in Somalia are largely unsuccessful as most of conflicts exist till today. The role of federal government is limited to the Somali peace processes and conferences with the ethnic motivated perceptions. They conclude that the federal government of Somalia is perceived by the public as involved in the conflicts and that thus formulate strong federal agencies to prevent any possible conflict in future, besides employing community based conflict resolution mechanisms.

### **3.4.1 Dynamics of land use and land cover change and causes of deforestation and degradation**

#### **3.4.2 Climate, soil and vegetation**

The project area consists largely of featureless plain, prone to flooding during rainy season often making roads impassable. The plain rises from an altitude of 6 m above sea level (asl) in Kismayo (Jubaland), 15 m asl in Bossaso (Puntland) and to 279 m asl in Guriel (Galmudug). The study areas are flat with four different types of soils: sandy soil, clay soil, lime soil and alluvial soil in parts of Jubaland. Out of the three study areas only Jubaland has perennial river, the rest have no perennial rivers, therefore, boreholes and rainwater harvesting and shallow wells are the main sources of water for human and livestock consumption as well subsistence crop irrigation.

Climatically the study areas lie in the arid zones prone to drought. Rainfall is scarce and erratic with two rainy seasons, the (spring) locally known as (*Gu*) from March to May and the Autumn, locally known as (*Dayr*) which lasts from October to December. The annual average rainfall in Puntland and Galmudug is between 150 to 300mm. The Lower Juba region in Jubaland is situated south of the equator and receives higher rainfall ranging between 400 and 700 mm per annum. The high rate of precipitation in Jubaland enables more vegetation cover compared to the other two study areas.

Generally, very limited data is available on these identified NTFPs in the country. The existed data is either outdated or not reliable. Another difficulty was that interviewed people cannot provide consistent data. During community interviews and group discussions, harvesters identified and feel pressure to put too many cuts on a tree or to harvest a second time during the winter instead of twice or once a year. This isn't due to ignorance or irresponsibility on their part, generally, but simply by wanting to provide adequately for their families and improve their lives. The open-access NTFP is more endangered compared to those owned by individuals. Drought hardiness is usually the most important feature of any tree species considered for planting in Somalia. The tree must be able to survive even if the rains fail; to make it worth planting it is important to stress that: There are Somali trees that do produce fruit, even though usually thorny. Protection of existing trees is usually more worthwhile than planting new ones.

The climatic conditions of an area dictate what plant species can survive within it. Somalia is a hot dry country with highlands in the north, a very long coastline, and two rivers in the south. Somalia's climate is changing which needs evidence-based research. The existing data for the climate in Somalia is done more than 50 years ago. As written in this study, 3 consecutive seasons of rainy was scattered and the country is now facing severe drought and some area declared a famine. Somalia is one of the hottest countries in the world. Mean annual temperatures range from over 30°C at Luuq to 18°C at Ceefigabo, which is at an altitude of 1800 m. The highest and lowest temperatures were also recorded from these

two stations: Luuq was 50.2°C and Ceerigabo was -3.3°C. Over most of Somalia, variation in temperature over the day is small; the phenomenon of hot days and cold nights is absent. Generally Somalia's weather patterns are such that:

- Rainfall is always very unpredictable as to where and when it will fall. Nomadic pastoralism is adapted to this fact.
- rainfall is more in the south than in the centre and north, except on the highlands of the north.
- temperature is cooler in the highlands of the north than anywhere else.
- Water evaporates from the sea and is deposited on the land close to the sea, in the early morning, causing sand dunes close to the sea to be able to support tree growth.
- Where rainfall is over than 400mm per year, (or where irrigation is possible from rivers, tugs or wells), dryland farming can take place. The climate and availability of water affects the trees species which can grow in a given place. For example, the cool wet climate of Dalo in the northern highlands support the Dayib (*Juniperus excelsa*) forests. The hot dry plains of Galgadud support the Gud (*Cordeauxia edulis*) shrub. for Gud/yicib tree it must be hot and dry. Therefore, it is important to learn which trees are suited to grow in each zone. Others, like Qurac (*Acacia tortilis*) can grow in a variety of climate zones. It must be stressed that the climate information is only rough and there may be some errors in the lists. Generally, the higher the altitude the cooler the climate.

Precipitation projections indicate a general increase in annual rainfall by the end of the century. However, it is projected that the climate in Somalia will become drier, warmer, more erratic, and more extreme than in recent decades and thus less favourable to crop, livestock, fisheries, and forestry-based livelihood systems (World Bank, 2021). Mean annual temperatures are projected to increase by around 3°C across all areas of Somalia by the end of the century (Ibid). In the north and northeast parts of Puntland temperature variation is high, from cooler temperature in winter around the Karkaar Mountains near the Gulf of Aden to around 45°C in the red sea areas in summer. In Jubaland, temperature variation is minimal, and it lies between 20°C in the coolest month and 30°C in the hottest months from February to April.

Shown in *figure 9* woodlands, wooded grasslands and the Somalia-Masai Acacia-Commiphora deciduous bushland and thicket are the main vegetation types in the study areas with over 2,500 different plant species of which approximately half are endemic to the Horn of Africa region (Hassan et al. 2019). The most common genera are *Acacia*, *Boswellia*, *Commiphora* and *Grewia*.

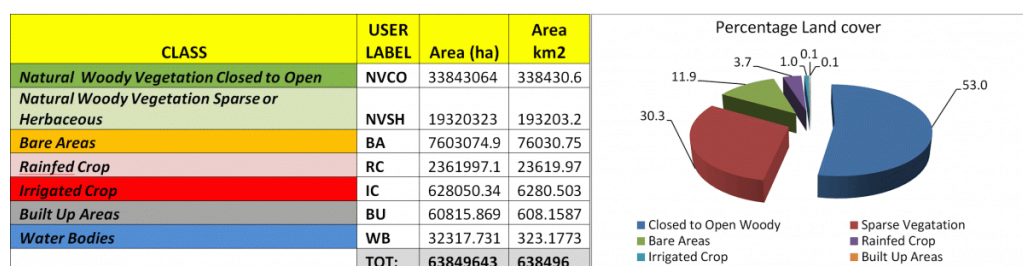


Figure 9: Land cover vegetation types Somalia

Source: SWALIM

## Guriel (Galmudug)

**Box 2: Spatial distribution of vegetation in study areas Kismayo (Jubaland), Bossaso (Puntland) Guriel (Galmudug)**

In the coastal plains vegetation consists mainly of herbaceous plants. The vegetation in this region extends to the feet and slopes of the Golis Mountains. Close to the mountains, the predominant vegetation is sparse bushy *Acacia*, *Balanites aegyptiaca*, and *Commiphora* associations including *Boswellia* species.

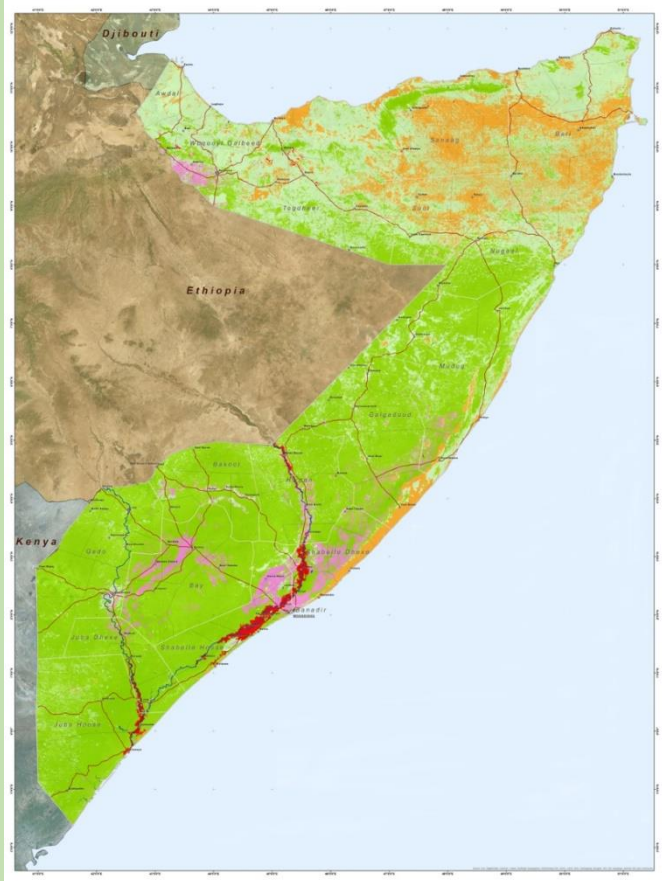
In the hinterland plateaus, vegetation is dominated by open shrubs and woody plants of *Acacia bussei*, *Acacia etbaica*, *Boscia* spp, *Cadaba* spp, and *Acacia mellifera*. Some herbaceous plants (mainly *Chrysopogon aucheri* and *Sporobolus* spp.) can also be found here.

In the central plains, vegetation varies from extensive grassland along the fixed dune areas to shrubby bushland with scattered trees in the west toward the Ethiopian border. Plants and bushes include *Andropogon kelleri*, *Chrysopogon aucheri*, *Sporobolus ruspolianus*, *Indigofera ruspolii*, *Acacia* spp., *Commiphora* spp., *Cordeauxia edulis*, *Delonix elata*, *Terminalia orbicularis* and *Dobera glabra* etc.

In the southern regions (especially in the floodplain), the vegetation type is mainly low deciduous bushland of *Acacia* spp. which extends to the coastal dunes.

In Jubaland, at points along the River Juba there are sections of riparian forest.

Mangrove swamp communities are situated at the tidal estuaries of the seasonal rivers towards the Indian Ocean coast and Gulf of Aden. They areas include Bushbush, Caanoole and Lag Badanaa. Mangroves are facing increased commercial exploitation



Source: FAO SWALIM <http://www.faoswalim.org/land/landcover#:~:text=Close%20to%20the%20mountains%2C%20the,Cadaba%20spp%2C%20and%20Acacia%20mellifera.>

### 3.4.3 Vegetation cover change

Vegetation cover change is linked to two main, interconnected causes: recurrent drought and inappropriate land use. Droughts are increasingly frequent, because of climate change which is exacerbated by poor land use and market-driven obstacles to environmental stewardship and resource governance. As a result, the 1.03% annual rate of deforestation is again three times that of neighbouring Kenya at 0.3%, and almost twice the 0.62% average rate of loss for Africa (World Bank 2020).

### 3.4.3.1 Landcover in the Jubaland State

### 3.4.3.2 Status of land tenure in Jubaland State

The state of Jubaland in 2010 is mainly made up of Scrub/Shrub which occupy nearly 77.77% or 8 687 895.86 hectares. These are followed by forests which occupy 2 208 660 hectares or 19.77% of the landscape against 1.49% (166 751 hectares) for Bare ground. Cultivated areas occupy 56 564.80 hectares (0.51%). Other forms of land use such as water areas, grassy savannahs, built areas and flooded vegetation occupy 0.36%, 0.001%, 0.07% and 0.03% of the landscape respectively. In 2022, the physiognomy of Jubaland State is still dominated by scrub/shrub on the one hand, which occupies 83.79% of the landscape, i.e. 9 359 923.72 hectares. Tree areas (forests) cover almost 13.46% (1 503 850 hectares). Cultivated areas represent 13.46% of the landscape, corresponding to 68 232.10 hectares. The other land use categories occupy respectively 0.001% for grassy savannahs, 0.11% for inhabited areas, 0.24% for water areas, 1.78% for Bare ground and 0.01% for flooded vegetation.

Table 7: Land use statistics in the Jubaland State

| Landcover          | Area (2010)          | %          | Area (2022)          | %          |
|--------------------|----------------------|------------|----------------------|------------|
| Water surface      | 39 795,60            | 0,36       | 26 540,40            | 0,24       |
| Trees              | 2 208 660            | 19,77      | 1 503 850            | 13,46      |
| Flooded vegetation | 3 164,77             | 0,03       | 1 403,08             | 0,01       |
| Crops              | 56 564,80            | 0,51       | 68 232,10            | 0,61       |
| Built Area         | 279,04               | 0,07       | 11 857,60            | 0,11       |
| Bare ground        | 166 751              | 1,49       | 199 291              | 1,78       |
| Grass              | 62,83                | 0,00       | 76,01                | 0,00       |
| Scrub/Shrub        | 8 687 895,86         | 77,77      | 9 359 923,72         | 83,79      |
| <b>Total</b>       | <b>11 171 173,90</b> | <b>100</b> | <b>11 171 173,90</b> | <b>100</b> |

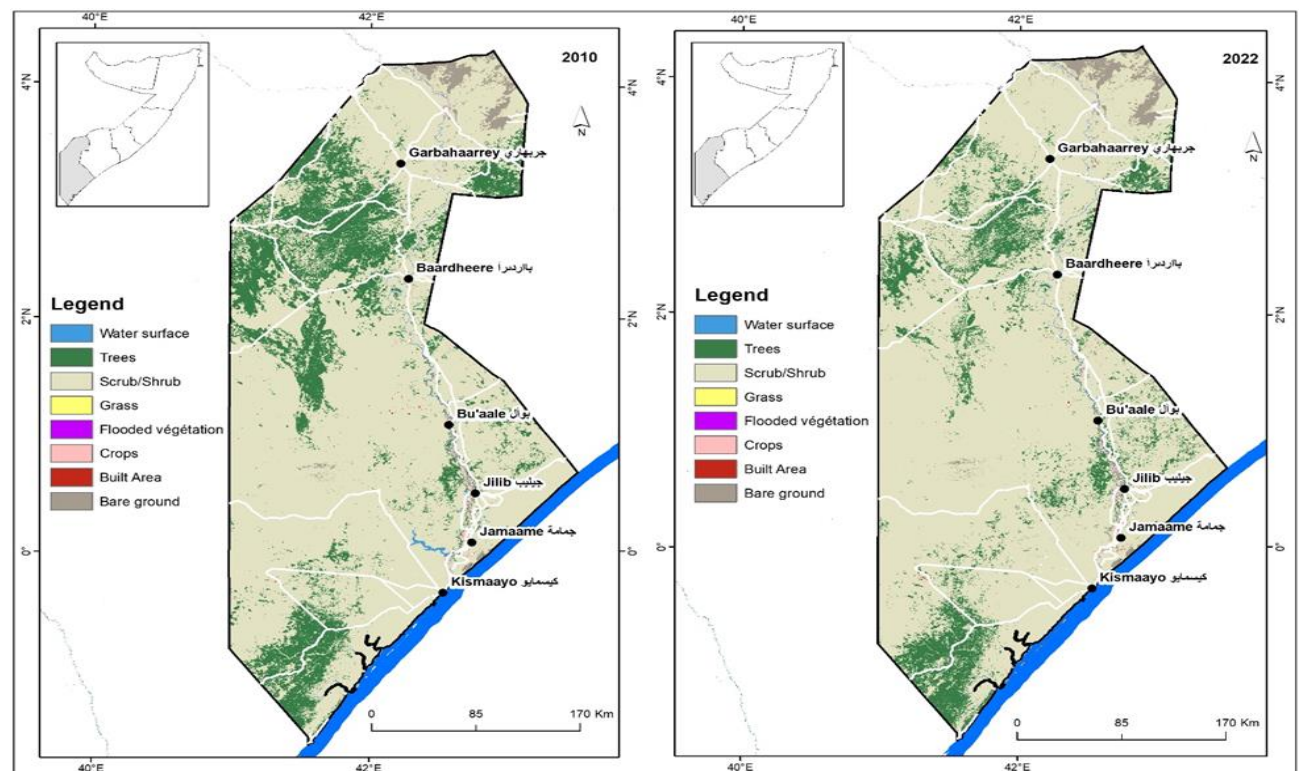


Figure 10: Land use in the state of Jubaland between 2010 and 2022

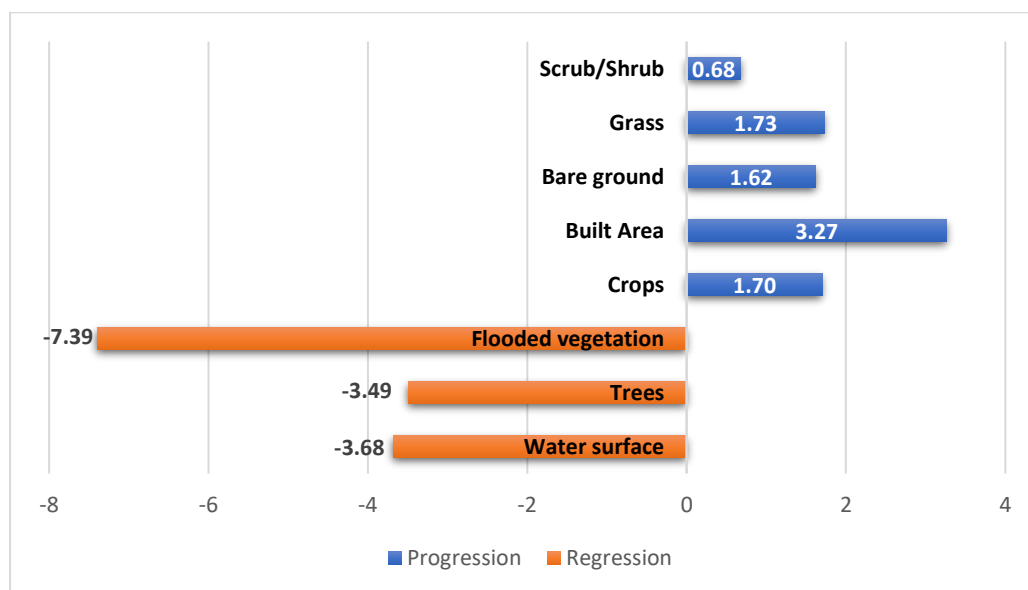
### 3.4.3.3 Changes in land use categories in Jubaland State

The land use class that has increased the most in Jubaland State is scrub/shrub, which has increased from 8,687,895.86 hectares in 2010 to 9,359,923.72 hectares in 2022, an increase of 672,027.86 hectares, corresponding to an annual rate of change of 0.68%. Residential areas have also increased dramatically. They have increased from 8,279.04 hectares in 2010 to 11,857.60 hectares in 2022, i.e. an increase of 3,578.56 hectares corresponding to an annual rate of change of 3.27%. On the bare ground side, there has also been a significant increase. They have increased from 166 751 hectares in 2010 to 199 291 in 2022, corresponding to an increase of 32 540 hectares for an annual rate of change of 1.62%. Wetlands have drastically decreased from 3,164.77 hectares in 2010 to 1,403.08 hectares in 2022, a change of 1,761.69 hectares for an annual change rate of 7.39%. Trees, however, have regressed dramatically from 2 208 660 hectares in 2010 to 1 503 850 hectares in 2022, i.e. a loss of 704 810 hectares, corresponding to an annual rate of change of 3.49%. The area under water has decreased from 39,795.60 hectares in 2010 to 26,540.40 hectares in 2022, i.e. a decrease of 13,255.20 hectares, for an annual rate of change of 3.68%. The other classes are more or less stable.

*Table 8: Change in the area of the different land classes between 2010 and 2022 in the Jubaland State*

| Landcover                 | Area (2010)   | Area (2022)   | Change of surface area | Annual rate of change |
|---------------------------|---------------|---------------|------------------------|-----------------------|
| <b>Water surface</b>      | 39 795,60     | 26 540,40     | - 13 255,20            | -3,68                 |
| <b>Trees</b>              | 2 208 660     | 1 503 850     | - 704 810,00           | -3,49                 |
| <b>Flooded vegetation</b> | 3 164,77      | 1 403,08      | - 1 761,69             | -7,39                 |
| <b>Crops</b>              | 56 564,80     | 68 232,10     | 11 667,30              | 1,70                  |
| <b>Built Area</b>         | 8 279,04      | 11 857,60     | 3 578,56               | 3,27                  |
| <b>Bare ground</b>        | 166 751       | 199 291       | 32 540,00              | 1,62                  |
| <b>Grass</b>              | 62,83         | 76,01         | 13,17                  | 1,73                  |
| <b>Scrub/Shrub</b>        | 8 687 895,86  | 9 359 923,72  | 672 027,86             | 0,68                  |
| <b>Total</b>              | 11 171 173,90 | 11 171 173,90 |                        |                       |

Figure 11 shows the proportions of annual changes in the different land use categories in Jubaland State between 2010 and 2022.



*Figure 11: Annual rate of change of spatial tenure categories in Jubaland 2010 and 2022*

### 3.4.3.4 Landcover in the Puntland State

#### Status of land tenure in Puntland State

The state of Puntland in 2010 is dominated by scrub/shrub which accounts for 15,116,029.49 hectares, corresponding to 93.66% of the spatial occupancy of the landscape. They are followed by bare ground which occupies 923,569 hectares or 5.72%. Forest areas represent 62,573.60 hectares, or 0.39% of the occupations. Water surfaces represent 31 104.90 hectares (0.19%). Cultivated areas represent 1 851.41 hectares (0.01%). Other types of land use such as residential areas cover 0.03% (4,931.56 ha). In 2021, the landscape is still dominated by scrub/shrub (13,623,750.00 hectares), followed by bare ground, which accounts for 2,440,480 hectares (15.12%) of the spatial occupancy. Trees represent 31,876.30 hectares (0.20%), while water areas represent 30,941.20 hectares (0.19%), crop areas 5,223.73 hectares (0.03%) and residential areas 7,788.73 hectares (0.05%).

Table 9: Land Use Statistics in Puntland State

| Landcover     | Area (2010)   | %     | Area (2022)   | %     |
|---------------|---------------|-------|---------------|-------|
| Water surface | 31 104,90     | 0,19  | 30 941,20     | 0,19  |
| Trees         | 62 573,60     | 0,39  | 31 876,30     | 0,20  |
| Crops         | 1 851,41      | 0,01  | 5 223,73      | 0,03  |
| Built Area    | 4 931,56      | 0,03  | 7 788,73      | 0,05  |
| Bare ground   | 923 569       | 5,72  | 2 440 480,00  | 15,12 |
| Scrub/Shrub   | 15 116 029,49 | 93,66 | 13 623 750,00 | 84,41 |
| Total         | 16 140 059,96 | 100   | 16 140 059,96 | 100   |

Figure 12 shows the spatialization of the different land use categories in Puntland State between 2010 and 2022.

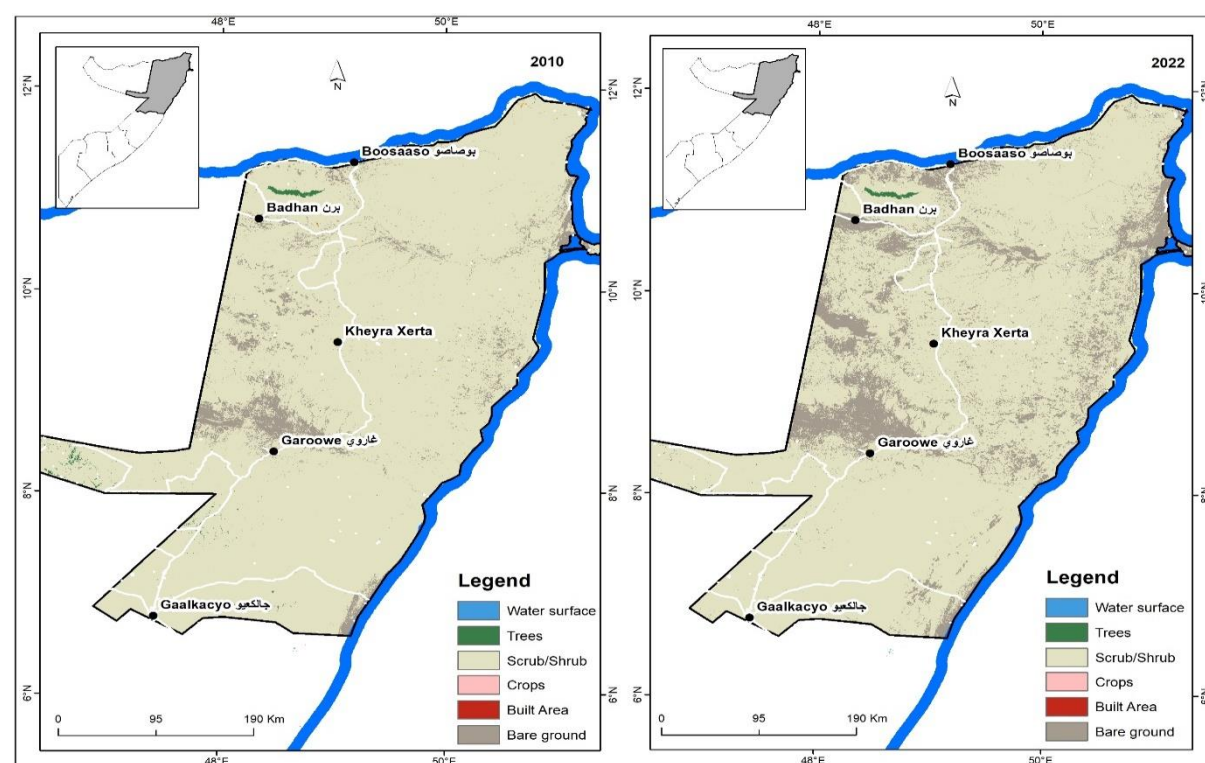


Figure 12: Land use in Puntland State between 2010 and 2022

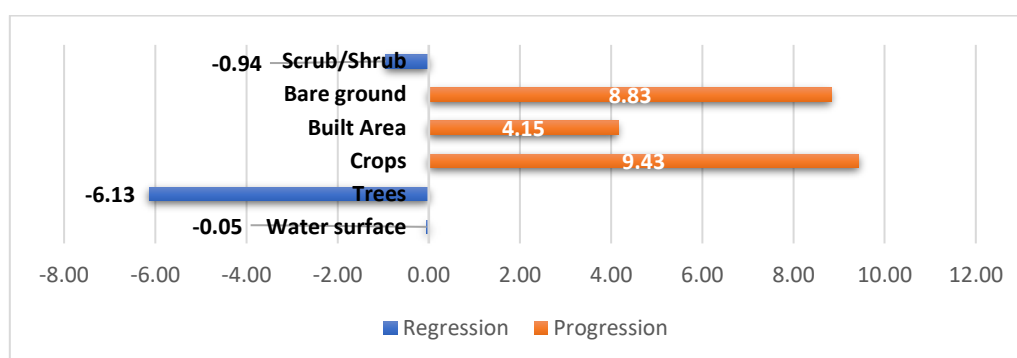
### Changes in land use categories in Puntland State

The evolution of the different land use categories in Puntland shows significant changes. This is the case, for example, for cultivated areas, which have increased from 1 851.41 hectares in 2010 to 5 223.73 hectares in 2022, an increase of 3 372.32 hectares, corresponding to an annual rate of change of 9.43%. This expansion of cultivated land can be explained by the galloping demographic explosion, coupled with the migration of certain populations who find refuge in the state. Bare ground has also increased from 923 569 hectares in 2010 to 2 440 480 hectares in 2022, for an annual rate of change of 8.83% (1 516 911 hectares). However, trees have declined dramatically. They have fallen from 62 573.60 hectares in 2010 to 31 876.30 hectares in 2022, a loss of 30 697.30 hectares, corresponding to an annual rate of change of 6.13%. Residential areas have almost doubled. They have increased from 4,931.56 hectares in 2010 to 7,788.73 hectares in 2022, i.e. an increase of 2,857.17 hectares for an annual rate of change of 4.15%. This increase in surface area can be justified by the proliferation of new villages, the main cause of which is growing insecurity in the area.

*Table 10: Evaluation of the Surface area of the different land use categories between 2010 and 2022*

| Landcover            | Area (2010)   | Area (2022)   | Change of surface area | Annual rate of change |
|----------------------|---------------|---------------|------------------------|-----------------------|
| <b>Water surface</b> | 31 104,90     | 0 941,20      | -163,70                | -0,05                 |
| <b>Trees</b>         | 62 573,60     | 31 876,30     | - 30 697,30            | -6,13                 |
| <b>Crops</b>         | 1 851,41      | 5 223,73      | 3 372,32               | 9,43                  |
| <b>Built Area</b>    | 4 931,56      | 7 788,73      | 2 857,17               | 4,15                  |
| <b>Bare ground</b>   | 923 569       | 2 440 480     | 1 516 911              | 8,83                  |
| <b>Scrub/Shrub</b>   | 15 116 029,49 | 13 623 750    | -1 492 279,49          | -0,94                 |
| <b>Total</b>         | 16 140 059,96 | 16 140 059,96 |                        |                       |

Figure 13 presents the proportions of annual changes in the different land cover categories in Puntland State between 2010 and 2022.



*Figure 13: Annual rate of change in land use categories in Puntland State 2010 and 2022*

### 3.4.3.5 Landcover in the Galmudug State

#### Status of land tenure in Galmudug State

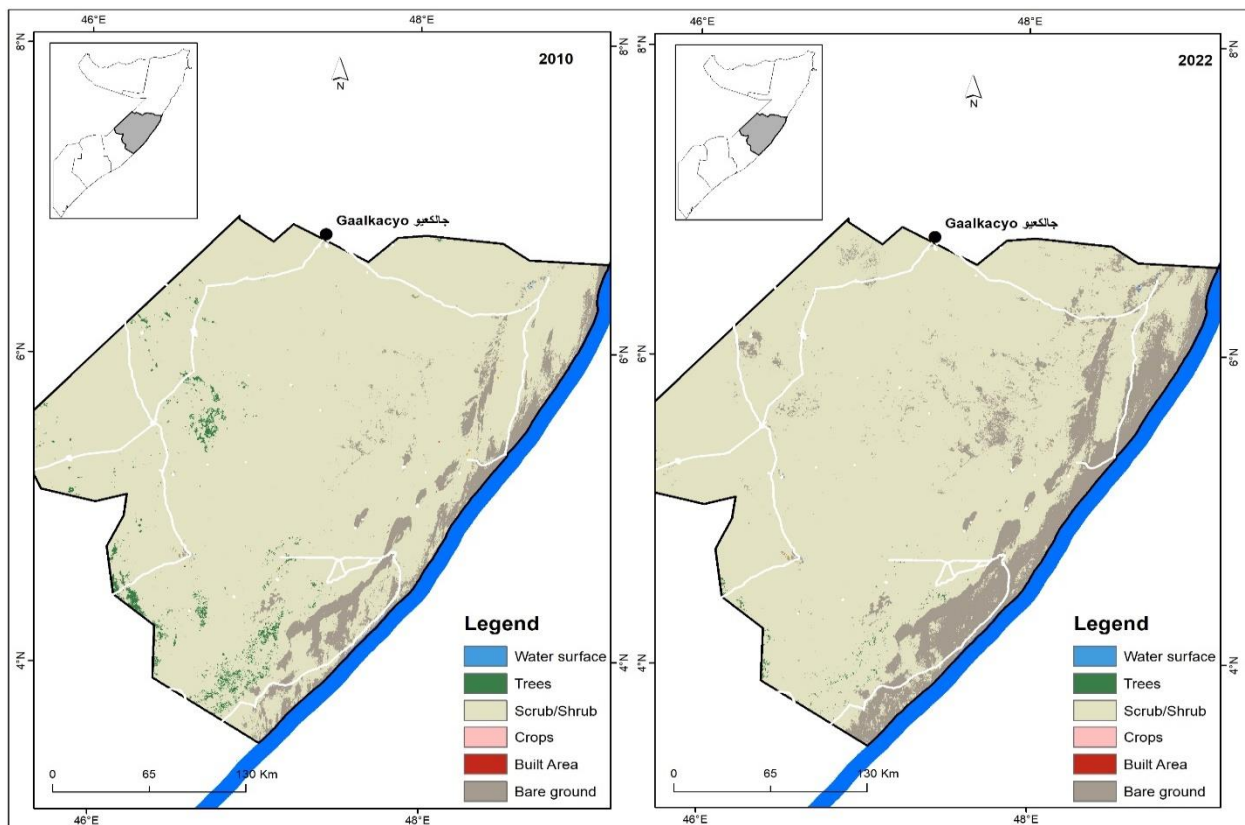
In 2010, scrub/shrub dominated the State of Galmudug, accounting for 7,718,946.67 hectares, or 91.85% of the landscape area. Bare ground is estimated at 533,621 hectares (6.37%), while cultivated areas represent 1,792.46 hectares (0.02%). Built-up areas, forests and water areas occupy 0.05% (4 262.93 hectares), 1.42% (119 687 hectares) and 0.30% (25 513 hectares) of the area respectively. In 2022, the landscape morphology is still largely occupied by scrub/shrub, which accounts for 7,231,680 hectares, corresponding to 86.05% of spatial occupancy. They are still followed by bare ground which

occupies 1 123 501.50 hectares, or 13.37%. Cultivated areas represent 1 878.13 hectares (0.02%). Other types of land use such as residential areas, forests and water areas cover 0.03% (2,144.43 hectares), 0.19% (16,284.30 hectares) and 0.31% (26,097.20 hectares) respectively.

*Table 11: Land Use Statistics for the Galmudug Region*

| Landcover            | Area (2010)      | %          | Area (2022)         | %          |
|----------------------|------------------|------------|---------------------|------------|
| <b>Water surface</b> | 25 513           | 0,30       | 26 097,20           | 0,31       |
| <b>Trees</b>         | 119 687          | 1,42       | 16 284,30           | 0,19       |
| <b>Crops</b>         | 1 792,46         | 0,02       | 1 878,13            | 0,02       |
| <b>Built Area</b>    | 4 262,93         | 0,05       | 2 144,43            | 0,03       |
| <b>Bare ground</b>   | 533 502          | 6,35       | 1 125 620           | 13,39      |
| <b>Scrub/Shrub</b>   | 7 718 946,67     | 91,85      | 7 231 680           | 86,05      |
| <b>Total</b>         | <b>8 403 704</b> | <b>100</b> | <b>8 403 704,06</b> | <b>100</b> |

Figure 14 shows the spatial situation of land use in Galmudug State between 2010 and 2022.



*Figure 14: Land use Galmudug State between 2010 and 2022*

### Changes in land use categories in Galmudug State

Table 6 and Figure 6 present the statistics of annual changes in land use in Galmudug State between 2010 and 2022. During this period, tree areas suffered the greatest loss, at 103,402.70 hectares for an annual rate of change of 18.13%. Bare ground recorded a gain of 6.73% or 587,881 hectares. Residential areas also recorded an increase of 6.25%, corresponding to an area of 2 118.50 hectares. As for cultivated land, it recorded a gain of 0.42% of land cover, corresponding to 85.67 hectares during this period.

Table 12: Evolution of the surface area of the different land use categories between 2010 and 2022

| Landcover     | Area (2010)         | Area (2022)         | Change of surface area | Annual rate of change |
|---------------|---------------------|---------------------|------------------------|-----------------------|
| Water surface | 25 513              | 26 097,20           | 584,20                 | 0,21                  |
| Trees         | 119 687             | 16 284,30           | - 103 402,70           | -18,13                |
| Crops         | 1 792,46            | 1 878,13            | 85,67                  | 0,42                  |
| Built Area    | 4 262,93            | 2 144,43            | - 2 118,50             | -6,25                 |
| Bare ground   | 533 502             | 1 125 620           | 592 118                | 6,79                  |
| Scrub/Shrub   | 7 718 946,67        | 7 231 680           | - 487 266,67           | -0,59                 |
| <b>Total</b>  | <b>8 403 704,06</b> | <b>8 403 704,06</b> |                        |                       |

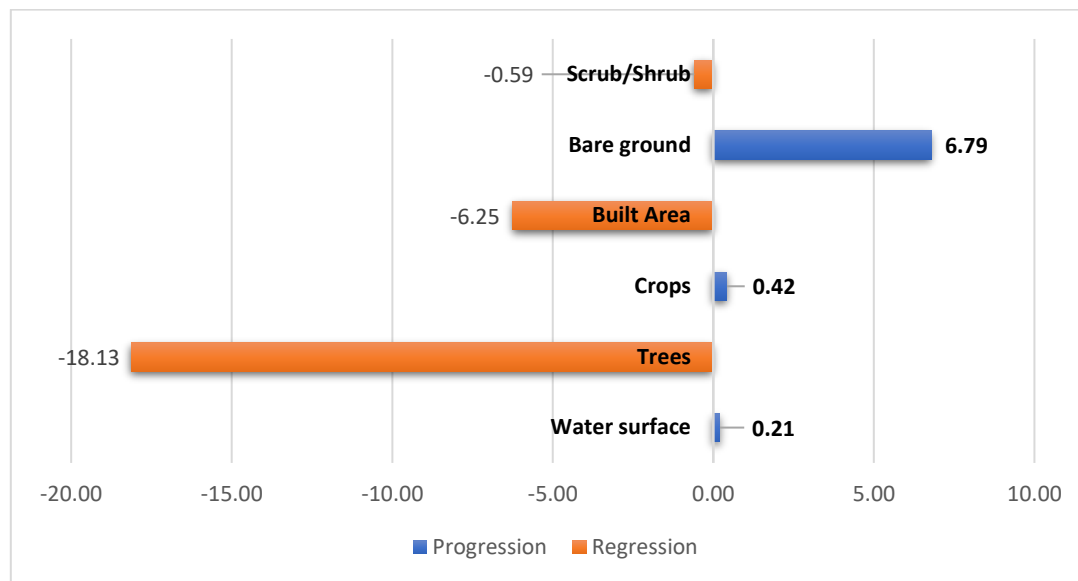


Figure 15: Annual rate of change of land use categories in Galmudug State 2010 and 2022

### 3.4.3.6 Perceptions of vegetation cover changes

The household surveys indicated perceptions that the natural resource base in the three study areas is seriously threatened, disappearing or degrading due to deforestation, long spells of droughts, floods and over-grazing. Shown in Figure 16, respondents indicated the factors they perceive reducing tree resources. Respondents from Jubaland (100%) and Galmudug (90%) indicated tree cutting as the primary cause of forest depletion, while respondents from Puntland believe that drought is the main cause.

Deforestation occurs in two forms: land conversion for other uses, mainly crop production/building up (urbanization), and cutting of woody plants in search of extra incomes or household consumption, i.e. for energy, construction, fences etc. In the project area charcoal burning is graded as the second biggest cause of deforestation and desertification as indicated by the respondents. For the last fifteen years charcoal trading was among the most important export commodity in the country, generating millions of dollars per years. As a result of prolonged civil war and frequent droughts many pastoralists and agro-pastoralist ended up as IDPs. Therefore, due to lack of other opportunities, many poor men (IDPs) found charcoal burning as an option of income generating (tragedy of the commons). The price of the charcoal depends on the quality of the charcoal; the best quality is the one with high energy efficiency and of course every tree cannot produce good quality charcoal, thereby the charcoal burners target specific tree species. Among the most extensively logged trees for charcoal production are the centenarian trees of *Acacia tortilis* and *Acacia busei*.



Photo 12: Recently felled *Acacia tortilis* trees for charcoal production, near Kismayo, Jubaland

These trees are locally important multi-purpose trees with high socio-economic and ecological benefits. Thereby, such exploitation activities of the aforementioned species caused uncountable social and environmental problems. Hence, the civil societies, scholars and international NGOs mobilized the charcoal issue for the last ten years or so. In response to the local administrations in the project areas also issued a law banning cutting of living trees of *Acacia tortilis* and *Acacia busei*.

However, due to lack of capacity for law enforcements the problem didn't stop. On the other hand, the law permits utilization of dead tree (s) of these species for charcoal production; therefore, the charcoal burners developed new techniques. According information obtained from group discussion and key informant interviews, both charcoal burners and firewood collectors started contaminating the tree's root systems in order to kill the tree (s) by putting salt and used engine oil in the root level of the trees and eventually the trees die and they use it for charcoal production or as firewood.

### 3.5 Policy and institutional capacity and gaps

#### 3.5.1 Capacity gaps

There are huge gaps in capacities of institutions and individuals to manage the environment and natural resources in Somalia. Over 90% of all the individuals interviewed had no formal environment and natural resources management trainings. In Jubaland, only two persons had a Master's degree in natural resources management out of 17 employees. The situation is worse in Galmudug as none of the staff had formal training on environment and natural resources management. During key informant interviews, one respondent said, "*The ministry of Environment, Climate change and rural development of Galmudug just exist by name*", and further said "*the ministry has no mentionable workplace facilities or trained staff*". This is consistent with fact that, for over three decades Somalia had no fully functioning central government coupled with prolonged civil war. These had devastating effects on the institutional capacity of all government institutions, particularly the environment and natural resources management sectors. Education institutions collapsed, civil servants, teachers and researchers fled the country for asylum, and research archives, data, Lab equipment and literature resources have disappeared.

In Puntland however, due of long-time security stability, its institutional capacity is much better than the other two states. Approximately 90% of the staff of the ministry of Environment, Agriculture and Climate change of Puntland had basic environmental management trainings said the Director General of the ministry. In group discussions when asked why Puntland has more institutional capacity compared to Galmudug and Jubaland, the common response was that a) Because of security stability,

Puntland was able to attract expatriates that were giving training to the staff through UN agencies and b) as the oldest federal member state, the institutional capacity was built over time.

summarises the capacity gaps and the capacity building needed.

**Table 13: Capacity gaps, Training needs, and infrastructure and resource needs**

| Capacity gap                                                | State (s) | Training                                                                                                         | Infrastructure & resources needed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Rank |
|-------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Sustainable management and utilization of natural resources | All       | Forest resources management                                                                                      | <ul style="list-style-type: none"> <li>Establishment of state level dryland forest research centres</li> <li>Establishment of nursery and forestry trial sites</li> <li>Forest lab equipment</li> <li>Weather station equipment e.g. wind vane, rain gauge, mini-max thermometers at secondary and tertiary institutions and district headquarters</li> <li>Training classes and auditorium</li> <li>Computers, print and Software Programmes</li> <li>Data management &amp; data analysis</li> <li>Professional trainers</li> </ul> | 5    |
| Biodiversity restoration                                    | All       | Biodiversity conservation<br>Rehabilitation of degraded land                                                     | <ul style="list-style-type: none"> <li>Land rehabilitation techniques; Soil and Water conservation, Agroforestry, Famers-Managed Natural regeneration &amp; enclosure systems, and local species identification trainings</li> <li>Marine ecology and Marine resources management trainers</li> </ul>                                                                                                                                                                                                                                | 5    |
| Environmental management                                    | All       | Mainstreaming Rio Conventions<br>Environmental Impact assessment                                                 | <ul style="list-style-type: none"> <li>Industrial waste management and pollution prevention</li> <li>Plastic waste management<br/>Training and Awareness raising</li> </ul>                                                                                                                                                                                                                                                                                                                                                          | 5    |
| Waste management                                            | All       |                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |
| Climate change                                              | All       | GHG inventories data base,<br>Measurement, Reporting and Verification (MRV) systems<br>Adaptation and mitigation | <ul style="list-style-type: none"> <li>Establishment of Emission and Air quality control research station</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                 | 9    |

Scale: 5= Extremely important, 4 = Very important, 3= important, 2 = less important, 1 = not important.  
Participants: 9

### 3.5.2 Policy gaps

Somalia has never had a forestry policy. The main laws governing the forestry sector are the Law on Fauna (Hunting) and Forest Conservation (Law No. 15 of 25 January 1969). In the last three decades there has been a gap in terms of the regulatory framework. In 2020, the country developed and adopted the National Environmental Policy and the National Climate Change Policy. In addition, there is a draft National Charcoal Policy, draft National Forestry Policy and the draft Environmental Management Act.

The National Environmental Policy states that the government shall “*Promote the production and marketing of incense, as well as other health-related plants and their businesses*”. This is a direct reference to the enhancement of NTFPs utilization. Similarly, the draft National Forestry Policy recognizes the importance of NTFPs to the economy. In 1985 Somalia was the world’s largest



source of incense, and produced over 2,000 tonnes. The draft policy states: *“Local people in Somalia have harvested frankincense for millenniums, but there is a growing global appetite for frankincense. The global demand presents an enormous economic opportunity for Somalia to become a leading exporter of frankincense. This is an opportunity to diversify the economy and enhance the livelihoods of the people.”*

These policy commitments indicate that the government is keen to develop the forestry sector in general and NTFPs in particular. However, agroforestry is not specifically mentioned.

#### 4. Conclusion and Recommendations

The research indicates that there are at least 16 **NTFP tree producing species** in the three states with food (human and animal fodder), income and firewood and construction uses, many of which also provide ecosystem services. All of these species can be incorporated into and are suitable for agroforestry use. These species also have **conservation values** - being native to the area. Exotic tree species can also be more widely used and integrated into agroforestry systems. A focus on policy, practices and capacity building around NTFPs and agroforestry could contribute to realise the multiple benefits that agroforestry as a ecological-agronomic and social system could provide.

The impact of **weak governance capacity at state level and the influence of political economy** for the commercial viability of NTFP value chains means that tree resources are over exploited, generally not well managed unless they are private property. Added value in economic and social terms is generally limited and way under potential. Customary rules generally continue to govern resources, but are inadequate in the face of short term pressures such as drought and poverty. State institutions and laws that do exist are generally not enforced and the capacity for law enforcement and monitoring is low and underfunded. Private sector responsibility and interventions that add value (such as improved species, lowering costs, processing or quality improvements) in the value chains of products such as firewood, aromatic resins and Yi'ib nuts are generally lacking or low. There have been few federal state-led development initiatives to manage commercial NTFPs or the forest resources as a whole, and the forest sector and NTFPs sub-sector remain undeveloped. Also, contribution of the forest sector to national revenue is not documented. As the majority of the people in Somalia live in rural areas, their economic activities revolve around subsistence livestock rearing, crop farming, and NTFP harvesting as the second main form of income. This makes NTFPs a crucial resource base for both rural and urban households in Somalia. However, politicians and decision-makers at the federal and regional level have not yet realized the economic contribution of forests that provide both timber and non-timber products. Power and forest resources are distributed in Somalia among a range of formal and informal, domestic and international actors. These actors operate in various contexts, with differing consequences on forests and the value chains of non-timber forest products.

The dynamics of **land use and land cover change** mean that despite woodlands, wooded grasslands and the Somalia-Masai Acacia-Commiphora deciduous bushland and thicket being the dominant land cover in the three study states, deforestation and degradation is apparent. The 1.03% annual rate of deforestation is three times that of neighbouring Kenya at 0.3%, and almost twice the 0.62% average rate of loss for Africa. This is due to two main, interconnected causes: Recurrent drought and inappropriate land use.

**Institutional capacity** gaps strongly influence land use changes and capacity building needs. Key challenges for (agro)forestry include (a) shortage of human resources capital and institutional capacity, (b) security and political instability, (c) natural assets depletion and (d) rapid population growth paired with high urbanization rates. Negotiations on the state formation and the institutionalization of federalism elevate tensions over natural resource shares and representation among Somalis, often trigger violent conflict among inter-and intra-clan systems. The collapse of the state and governance structures as well as the lack of security, resulting in chronic conflict, and a lack of rule of law has placed enormous obstacles to consistent and sustainable management of environmental resources in the country. The resulting rapid deforestation has created conditions for desertification in semi-arid areas.

Hence, the following recommendations:

### Projects

1. Government and donor support and funding for an **enabling and sustainable business environment** and funding (e.g. micro credit, grants, low interest loans) to develop sustainable agroforestry and NTFP value chain projects with a focus on the whole chain and resilient livelihoods, strengthening and empowering women and youths, and empowering entrepreneurs operating in this sector.
2. National and state government organisations create **buffer zones** and **plant fast growing tree species** with multiple-purpose uses such as *Acacia tortilis*, for fuelwood and charcoal and food.
3. Develop and publicise an **agroforestry activity calendar** with distinct (regionally appropriate) periods of seed identification, collection and domestication of high socio-economic value NTFP species in agroforestry systems to improve production, ensure food security and increase incomes.
4. **National campaigns and public awareness raising** on the importance of forest resources and implications of forest destruction and ministries charged with issues related to the environment should harmonize their roles in order to put in place a single front against environmental degradation while promoting climate change adaptation among farmers and pastoralists.
5. **Domestication of high socio-economic value species** and integration into agroforestry systems to improve their production in these systems.
6. Develop locally appropriate **biodiversity restoration and sustainable exploitation** models which valorise multi-purpose tree species to reduce food insecurity and biodiversity degradation.
7. **Adoption of tree planting /agroforestry on different land types**, incorporating multipurpose trees in farming systems and natural regeneration initiatives through FMNR and enclosures which to reduce pressure on natural vegetation and promote self-sufficiency among agropastoral people.

### Capacity building, education and research

8. Establishment of **National Forestry and Rangeland Research Institute**, responsible for Ecological, technological and socio-economic aspects of forest resources studies i.e.; Forest inventories, regeneration, reforestation, production, harvesting, processing and trade.
9. Re-establishment of the **Forestry Extension program** to train and retrain farm owners and NTFP exploiters on techniques of domestication, planting and harvesting NTFP species with multiple purpose use for agroforestry system.
10. Establish a **Forest and Range Management College** given the major capacity gap in human capital, because Somalia has no higher institutions that produce trained forestry personnel.
11. **Research** on the nutritional and calorific value of major NTFPs, value-adding activities and processes.

### Policy and governance improvements

11. Develop **national forest and land management policies** integrating different sectors and agencies (forestry, agriculture, development and trade), which promote participatory management systems at community and landscape levels whereby planning, management and implementation of conservation, sustainable multiple utilisation and restoration of agroforestry and NTFPs are achieved through stakeholder dialogue, negotiations, consensus and compromise to reconcile diverse views and interests
12. Make significant **institutional and legal reforms** regarding livestock, agriculture and forestry and trade such that the forestry laws and permits at national, state, provincial, district, and village levels are better disseminated and known in the field and enforced.
13. Establish a **geopolitical accord with Ethiopia** to harness water from the perennial Juba and Shabelle rivers.
14. **Rainwater harvesting and management system programs** to collect water from roofs, runoffs and ground catchment, preserve, stored and use during period of prolonged drought.
15. Government lead on **maintaining security and counteracting corruption** (eg bribes) to create an enabling business environment such that NTFP value chains represent feasible economic opportunities.

## 5. References

- Ali, H.M. (1988) *Cordeauxia edulis: production and forage quality in central Somalia*. MSc thesis. Faculty of Agriculture, Somali National University, Somalia.
- Ambrose-Oji, B. (2003). The contribution of NTFPs to the livelihoods of the 'forest poor': evidence from the tropical forest zone of South West Cameroon. *International Forestry Review* 5(2):106-117
- Awono, A., V. Ingram, J. Schure and P. Levang (2013). Guide for small and medium enterprises in the sustainable non-timber forest product trade in Central Africa, CIFOR.
- Bassene, E. (2008). Impact des produits médicaux à usage vétérinaire alternatifs et traditionnels en Afrique. Conférence de l'OIE sur les médicaments vétérinaires en Afrique, Dakar, 25 – 27 Mars, 7 p.
- Bikoue, M.A. and Essomba, H. (2006). Gestion des ressources naturelles fournissant les produits forestiers non-ligneux alimentaires en Afrique Centrale. FAO, Département des Forêts, 103 p.
- Meinhold, K. and D. Darr (2019). "The processing of non-timber forest products through small and medium enterprises—A review of enabling and constraining factors." *Forests* 10(11): 1026.
- FAO, WFP and IFAD (2012). The State of Food Insecurity in the World. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. FAO, Rome.
- Fasoyiro and Adegoke (2007). Phytochemical characterization and the antimicrobial property of *Aframomum daniellii* extract. *African Journal of Agricultural Research*. 3 (2): 076-079
- Godoy, R.A. and Bawa K.S. (1993). The economic value and sustainable harvest of plants and animals from the tropical forest: assumptions, hypotheses and methods. *Economic Botany*. 47(3):215-219.
- Hassan, B.A., Glover, E.K., Luukkanen, O., Kanninen, M. and Jamnadass, R., 2019. *Boswellia* and *Commiphora* Species as a resource base for rural livelihood security in the Horn of Africa: a systematic review. *Forests*, 10(7), p.551.
- Hassan, B. A. (2020). Trees for sustainable livelihoods in the Horn of Africa: Studies on aromatic resins and other non-wood forest products in Somalia and Kenya. E-thesis.
- ICRAF (2022) Reversing Land Degradation in Africa by Scaling-up Evergreen Agriculture (Regreening Africa) <https://www.worldagroforestry.org/project/reversing-land-degradation-africa-scaling-evergreen-agriculture-regreening-africa>
- Ingram, V. J. (2014). Win-wins in forest product value chains?: How governance impacts the sustainability of livelihoods based on non-timber forest products from Cameroon. African Studies Centre, Leiden.
- Ingram, V. and J. M. Lopes (2021). Guide for sustainable development of natural product value chains from Cabo Verde. Cabo Verde, Food and Agriculture Organization of the United Nations. November 2021.
- Kishor, Nalin, Selene Castillo and Nga Phuong Nguyen, 2015. The Political Economy of Decision-making in Forestry: Using Evidence and Analysis for Reform. Program on Forests (PROFOR). Washington DC.
- Kouyaté, A., Van, D. and Diawara, H. (2006). Evaluation de la production en fruits de *Detarium microcarpum* Guill. & Perr. Au Malia. *Fruits*, vol 61, no.4, pp.267 – 272.
- Lacombe, M. and Aronson, J. (2008). La restauration du capital naturelle en zones arides et semi-arides. Allier santé des écosystèmes et bien-être des populations. Les dossiers thématiques du CSFD. Numéro 7. 36 p.
- Leslie, Andrew (1991) Agroforestry practices in Somalia. *Forest Ecology and Management*, 45 (1-4). pp. 293-308.
- Mapongmetsem, P.M., Hamawa, Y., Djeumene, P., Maissele, Kossebe, C.F., Duryant, J.B., Bebbe, F., Bouba, D., Wouldata, S., Zigro, L. and Barbi, M. (2008). Valorisation des plantes alimentaires sauvages des savanes soudano-guinéennes. International Conference for the Development of agrifood and wealth creation. 9-11 July 2008. ENSAI, Ngaoundere, Cameroon.14p.
- Ministry of Planning and international cooperation, Department of Statistics (2012-2017). Facts and figures of Puntland

- Meinhold, K., & Darr, D. (2019). The processing of non-timber forest products through small and medium enterprises—A review of enabling and constraining factors. *Forests*, 10(11), 1026.
- Neumann, R.P and Hirsch, E. (2000). Commercialisation of Non-Timber Forest Products: Review and Analysis Research. Center for International Forestry Research, Indonesia.
- Paumgarten, F. (2007). The significance of the safety-net role of NTFPs in rural livelihoods, South Africa, *Environmental Sciences*, Grahamstown, South Africa.
- Pay Drechsel, & Zech, W. (1988). Site Conditions and Nutrient Status of *Cordeauxia edulis* (Caesalpiniaceae) in Its Natural Habitat in Central Somalia. *Economic Botany*, 42(2), 242–249. <http://www.jstor.org/stable/4255071>
- Prasad, R., Shukla, A., & Sing, P. (2019). Agroforestry and Livelihood Opportunities from Natural Resins and Gums (NRGS) including Lac. *Agroforestry Research and Development to Improve Livelihood. Nutritional and Environmental Security: Policy, Practice and Impact*, 145-156.
- Tieguhong, J.C. and Zwolinky, J., (2009). Supplies of bush meat for livelihoods in logging towns in the Congo Basin. *Journal of Horticulture and Forestry* 1 (5).
- Tieguhong, J.C., Ndoeye, O., Grouwels, S., Mala, W.A. and Betti, J.L. (2012). Rural enterprise development for poverty alleviation based on non-wood forest products in Central Africa. *International Forestry Review*. 14, 363 – 379 (17).
- Tieguhong, J.C., Ndoeye, O., Vantomme, P., Zwolinsky, J. and Masuch, J. (2009). Coping with crisis in Central Africa: enhanced role for non-wood forest products. *Unasylva* 233 (60):49-54.
- Vedeld, P., Angelsen, A., Bojo, J., Sjaastad, E. And Kobugabe Berg, G. (2007). Forest environmental incomes and the rural poor. *Forest Policy and Economics* 9 (7):869-879.
- Sumra, K. B. & A.A Almi (2020) Role of Federal Government in Managing Conflicts: Somalia. *International Journal of Innovative Science and Research Technology* 5: 8, August – DOI:10.38124/IJISRT20AUG239
- State Minister for Environment, Office of the Prime Minister and Line Ministries and Ministry of Planning Federal Government of Somalia (November, 2015). Somalia's Intended Nationally Determined Contributions (Indcs)
- Webersik, C., Hansen, S.J. and Egal, A. (2018). Somalia: A political Economy Analysis. Norwegian Institute of International Affairs.
- World Bank (2020) Somalia Country Environmental Analysis: Diagnostic Study on Trends and Threats for Environmental and Natural Resources Challenges. <https://openknowledge.worldbank.org/handle/10986/34058?show=full>
- World Bank (2022) Somalia needs its trees to restore landscapes and livelihood Abdirahman Zeila Dubow. July 27, 2022 <https://blogs.worldbank.org/african/somalia-needs-its-trees-restore-landscapes-and-livelihoods#:~:text=One%20of%20the%20most%20important,of%20carbon%20dioxide%20equivalent%20emissions>.
- World Bank (2022) Somalia Ease of Doing Business - 2022 Data - 2023 Forecast
- Yusuf, M., Teklehaimanot, Z. and Gurmu, D., 2013. The decline of the Vulnerable yeheb *Cordeauxia edulis*, an economically important dryland shrub of Ethiopia. *Oryx*, 47(1), pp.54-58.