Food and Agriculture Organization of the United Nations

NGARA

Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa's Drylands - A Regional Synthesis Report

And

Support to the formulation of a GCF project on: Scaling-Up Resilience in Africa's Great Green Wall (SURAGGWA)

By

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The Network for Natural Gums and Resins in Africa

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List of abbreviation and acronyms

AAD – Action Against Desertification

AFF - African Forest Forum

AFWC - African Forestry and Wildlife Commission

AUC - African Union Commission

CSIR – Centre for Scientific and Industrial Research

FAO – Food and Agriculture Organization of the United Nations

FORIG – Forestry Research Institute of Ghana

GCF - Green Climate Fund

GGW - Great Green Wall

KALRO- Kenya Agricultural and Livestock Research Organization

LOA - Letter of Agreement

MT – Metric Tonne

NAGAPPEN - National Association of Gum Arabic Producers, Processors and Exporters Association of Nigeria

NFP - National Focal Point

NGARA – Network for Natural Gums and Resins in Africa

NTFPs - Non Timber Forest Products

PAGGW - Pan African Agency of the Great Green Wall

RAF - Regional Office for Africa

SDGs – Sustainable development goals

SURAGGWA - Scaling-Up Resilience in Africa's Great Green Wall

SWOT - Strengths, Weaknesses, Opportunities, Threats

TCP – Technical Cooperation Programme

TNA - Training Needs Assessment

UNFCCC – United Nations Framework Convention on Climate Change

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Executive summary

The FAO-NGARA studies on “Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa’s Drylands; and, contributing to support to the formulation of a GCF Multi-country funding proposal on: Scaling-Up Resilience in Africa’s Great Green Wall (SURAGGWA)” were carried out to contribute towards FAO’s Strategic and Regional objectives, namely;

- SO2 - Make agriculture, forestry and fisheries more productive and sustainable,
- SO3 - Reduce rural poverty,
- Regional Initiative (RI) 2 - Sustainable production, intensification and value chain development in Africa (SP2/SP4), and
- Regional Initiative (RI) 3 - Building resilience in African Drylands (SP5)

The studies contributed as well to implementing some of the result areas of the NGARA Strategy “Overview and framework of priorities 2017–2030”, where FAO played a key role in its development. Additionally, the studies are also in support of the implementation of the African Union Union Sustainable Forest Management Framework in Africa (2020-2030).

The studies on “Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa’s Drylands” were implemented at country level, in six NGARA member countries of Ethiopia, Nigeria, South Sudan, Chad, Mali and Senegal accompanied also with a regional study on trade and markets as well as scoping study of other countries in the Sahel GGW Belt producing gum Arabic, complementing theses studies to contribute to the formulation of the SURAGGWA multi-country project in six countries of Burkina Faso, Chad, Mali, Niger, Nigeria and Senegal. The two studies are complementary and were implemented using a harmonized work plan and data collection methodologies and tools (i.e. EX-ACT Value Chain tool, gender sensitive data collection, poverty/vulnerability tools) that the experts were trained in during the regional programming and capacity building workshop organized by FAO Regional Office for Africa (FAO-RAF) in collaboration with FORIG and other partners undertaking studies on value chains of NTFPs in February 2020, in Kumasi, Ghana, among others.

To ensure that the information generated was comparable, experts discussed and agreed on a common approach to be used in implementing each of the tasks. FAO-RAF provided further details on selected countries and sites for implementing the SURAGGWA studies based on experience from an earlier FAO

project on Action Against Desertification (AAD). However, some of the proposed sites changed in some countries because of either shifts in production areas for gum Arabic due to climate change or security. Details of the sites are provided in the main text of this report, which is section 2.2.

NGARA participated in co-organizing various workshops and events with FAO and these activities are also captured in the report (section 3.12).

Results of the synthesis on status of production reveal that the main sources of gum Arabic of commerce are *Senegalia* (*Acacia) senegal* and *Vachellia* (*Acacia*) *seyal*. However, there exist other commercial gums that are marketed as gum Arabic in some countries. These include *Senegalia laeta* and *Senegalia dudgeon* in West Africa and *Senegalia polyacantha* in Eastern Africa, which however are not part of the official definition of the gum arabic of commerce. Additionally, there are various commercial gums produced and exported from producer countries. They include gums from Combretum and Alibizzia species in West Africa and gums from *Vachellia drepanolobium* in Eastern Africa. Of special interest is karaya gum from *Sterculia setigera* from Central and West Africa where Senegal is the leading producer and exporter from Africa.

With respect to the resource distribution, there is a general varied trend among countries in the Sahel and around the equator. There are clear shifts in the gum arabic production southwards among countries in the Sahel as shown by the isohyets but different scenarios in the countries near the equator, which showed shrinkage in the areas producing gum arabic. For example, natural stands of *S. senegal* in Burkina Faso in the Sahel, which were estimated at 15 million stands in 1997 are now estimated at about 10 million stands according to the results of the second national forest inventory in 2016. A general observation is that there is a decrease in rainfall levels with a corresponding increase of isotherms towards the south. Previous studies in Niger demonstrate a clear decrease in rainfall marked by a significant retreat of the isohyet curves towards the south for about 200 kilometers where the 400 mm isohyet curve of the dry period (1968-1985) is practically superimposed on that of 600 mm of the wet period of 1950-1967, indicating climatic change over the years 1970 and 1980 of the great drought. In Nigeria, only 50% of the forests in geneal that existed in 2007 remained 10 years later. The other 50% had been converted to croplands (41.7%) and other land uses (8.3%). There is an observed trend of states in the south becoming main sources of gum arabic. As regards countries around the equator, studies in North western Ethiopia studies have revealed increased trends of conversion of wood land to agricultural land where the share of agricultural land increased from 24.1% in 1985 to 42.2% in 2010 while the wood land cover diminished from its level of 28.5% to 16.7% in 2010. However, the driving factors were the same; climate

change and accompanying anthropogenic activities. In recent years however, insecurity brought about by Boko Haram in Chad, Niger and Nigeria as well as Islamic militants in Mali, Burkina Faso and Niger have resulted in displaced persons and refugees in the countries in the Sahel causing increased deforestation and loss of woody diversity.

Most of the production of gum arabic is from natural stands with generally low densities (between 50 – 300 stems per hectare) and low production of up to 338 kg per hectare. This production is true for natural stands, which can only be improved through restoration involving planting and/or Farmer / assisted Managed Natural Regeneration. There is an effort of establishing plantations mostly with Acacia producing trees in most countries in the Sahel with countries like Niger having established new plantations of more than 500,000 ha where most of the trees are of gum trees. This is a positive sign as gum trees are contributing to the sustainable management and restoration of fragile agro-sylvo-pastoral ecosystems affected by desertification, land degradation and drought.

Regarding status of management, most of the dry forests (woodlands and Bushlands) are under the government either at the national level or by County/regional governments on behalf of the communities. Because of the low capacities in most government institutions, management of the resources is limited resulting in their rapid degradation. Lack of awareness of their importance combined with inadequate knowledge about sustainable production and marketing of their products as well as lack of alternative for wood and agricultural expansion contribute to the degradation.

Review of the gum samples received confirmed that *Senegalia senegal* is the main source of commercial gum arabic traded in the region. *Vachellia seyal* is the second most traded gum submitted from six of the countries. *S. polycantha and S. laeta* are collected and traded as gum arabic in some countries in Eastern and West Africa but are not part of the official definition of the gum arabic of commerce. Most of the samples supplied were commercial and of varying colours, shapes and sizes and had impurities of bark or sand. Different colours and presence of impurities affect the quality of gum hence the need for cleaning, sorting and grading, which is recommended to start at the level of collectors/producers, especially cleaning.

The minimum quality parameters for commercial samples for quality control include moisture content (MC), ash content (AC), specific rotation, nitrogen (hence protein) and viscosity. All the samples supplied from S*. senegal and V. seyal* conformed to the standard specification indicating that there was no

adulteration as was observed previously, thanks to the awareness that has been made in the producer countries over the last few years.

Analysis of stakeholders in the gum arabic sector identified two main categories; actors along the value chain and those providing support to the sector. The former comprises of the collectors, merchants, exporters and processors while the latter category includes the government, development partners and non-governmental organizations. The report provides a brief description of each actor and their roles. It has further dis-aggregated the actors along the value chain by gender with a focus on women and youth. Results showed that women and youth (boys and girls) are the main players in the harvesting and post-harvest handling activities but generally lack suitable knowledge and tools for enhanced quality and quantity production. Men are more involved as merchants both at local and national levels. A further analysis of benefit sharing arrangement showed that though there was variation in the costs incurred by collectors in different countries they generally obtain a good return on their investment with profit margins ranging between 46% in Tanzania to 55% in Niger. However, profit margins for wholesalers were the least and ranged from -7% in Tanzania to 15% in Niger, largely affected by heavy government taxes, which eat into the profits. Exporters received modest margins of 6% to very good margins of the highest margin of 94% in Tanzania.

Meanwhile, the existing capacity in the gum Arabic sector in terms of value addition and markets was examined by carrying out an assessment of value addition technologies and storage systems in production and trade of gum arabic followed by SWOT analysis related to value addition and markets of gum arabic. It was observed that value addition technologies comprise primary (harvest and post-harvest) and secondary (processing). The status of harvest and post-harvest handling were reviewed and best practices highlighted. As regards secondary aspects of value addition, it was noted that only Sudan, Nigeria and Senegal have established plants for processing of gum arabic into spray dried form and that Sudan and Chad have also kibbling plants that are able to break gum nodules into more or less uniform pieces making them easier to dissolve during spray drying process. However, there is no formal processing in most of the producer countries, an aspect that denies countries from getting premium value for their gum arabic.

On matters of policies and regulations, it was observed that this is an area which has not been properly addressed for the gums sector compared to other agricultural and related natural resource sectors. An evaluation of the existing policies reveal that there are no policies that explicitly address the gums sector

though there exist various policies that cover forest resources/commodities that are relevant to the gums sector.

There exist several institutions in producer countries involved in the gum arabic sector but there is lack of proper coordination, organization and documentation, which has hampered proper development of the sector. The absence of clear policies and laws/regulations for the sector have partly contributed to the situation while in other circumstances the relevant institutions are scattered in different sectors and ministries affecting proper coordination. Only three countries (Kenya, Nigeria and Sudan) have established relevant associations to articulate interests of the sector.

Regarding training needs assessment, results revealed that the level of knowledge and skills varied among stakeholders and also in different countries. Collectors, at the farm gate level, had better knowledge about trees producing different gums but low level of understanding regarding harvesting and post-harvest handling, which are serious gaps for ensuring good quality and quantity produced. Merchants including exporters had better knowledge about the uses, especially commercial, trade and marketing of the gums, which is understandable as it is their core business. Policy makers and Extension agents were more knowledgeable on matters of policies and laws notably because they are the ones responsible for formulation and implementation respectively. The same were familiar with aspects of climate change. Overall, general knowledge of the stakeholders' in the study countries reveals that exporters and merchants have better overall knowledge while collectors and village traders have moderate understanding. What is still lacking is awareness creation for greater impact and proper development of the sector. There is therefore still need to carry out comprehensive training for all the stakeholders to enhance the level of knowledge in the development of the gums sector in the African Region. A review carried out on the "Regional Training Master Plan" that was prepared for gums and resins in 2005 revealed that the plan is still relevant and only requires updating to include new topics on climate change and governance, among others. A draft training Master plan was revised and is included in annex 4.

1.0 Introduction

1.1 Background to the study

The studies on “Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa’s Drylands and “Support to the formulation of a GCF project on: Scaling-Up Resilience in Africa’s Great Green Wall (SURAGGWA)” were conducted in support to the the African Union SFM Frameowrk in Africa (2020-2030) and FAO’s African Forestry and Wildlife Commission Programme adopted in 2020, as well as to support NDC implementation/ climate action by the selected countries. The former was formulated upon a request to the African Union Commission (AUC) by African member countries during the Second Drylands Week Conference held in Ndjamena, Chad in 2014 to put in place strong institutional mechanisms for better coordination of the production and trade in gum Arabic as one of the ways of alleviating poverty in rural communities in Africa and contribute to sustainable land management in the drylands. The AUC reached out to its key partners, the FAO and the African Forest Forum (AFF) who in turn identified the Network for Natural Gums and Resins in Africa (NGARA) as a suitable institution in spearheading the development of the Gums and Resins sector considering its vast experience in this area. Under the FAO-TCP, NGARA worked closely with FAO, AUC and AFF to formulate the regional (NGARA) Strategy: Overview and Framework of Priorities 2017-2030, which was published with support from FAO and is a very valuable tool that will form the basis for driving the gums, resins and allied dryland resources and commodities for improving livelihoods and conservation of the environment, especially with the advent of Climate Change. FAO secured some funds to support implementation of the NGARA strategy in member countries through a study entitled “Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa’s Drylands”. A Letter of Agreement (LOA) was signed between FAO and NGARA in September 2019.

The SURAGGWA multi-country project under development by FAO for submission to the GCF, is supporting the African Union (AU) Commission, the Pan African Agency of the Great Green Wall (GGW) and 6 GGW countries (Burkina Faso, Chad, Mali, Niger, Nigeria and Senegal) in accessing GCF funds through the formulation of a Green Climate Fund (GCF) co-financed multi-country project to scale-up successful climate actions for the implementation of the AU GGW Initiative. The Project is called “Scaling-Up Resilience in Africa’s Great Green Wall (SURAGGWA)”. In preparation for the SURAGGWA project, FAO organized in collaboration with CSIR- FORIG, a regional programming and capacity building workshop in February 2020, Kumasi, Ghana for its regional and

country partners and teams involved in the project formulation including the Network for Natural Gums and Resins Network in Africa (NGARA), African Forest Forum (AFF), CSIR-Forestry Research Institute of Ghana (FORIG), the Pan African Agency of the Great Green Wall (PAGGW) and Kenya Agricultural and Livestock Research Organization (KALRO), as well as FAO experts. NGARA is implementing the studies focusing on the gum arabic value chain.

The two studies above are therefore complementary and were implemented using the work plan below and the data collection methodologies and tools (i.e. EX-ACT Value Chain tool, gender sensitive data collection and poverty/vulnerability tools) that experts were trained in during the regional programming and capacity building workshop in Kumasi in February 2020, Ghana, among others.

Meanwhile, NGARA was also tasked in the LOA to implement various expert workshops that culminated with a partners' workshop on the review and validation of NTFPs related studies contributing to the formulation of component 2 related to NTFPs Value Chains of the SURAGGWA funding proposal. This report therefore covers activities relating to progress in implementing the two studies as well as the organized workshops.

1.2 Description of the objectives for the two studies

Under the supervision of NGARA, the technical backstopping of FAO-RAF, and support of relevant experts in FAO (HQ, RAF and country offices), national Experts will:

1. Conduct literature reviews to: a). generate information on the status of the resource base [gum arabic producing areas (including species – bolstered by photos), productivity, conservation/management status, potential areas of production and related landscapes (including existing maps) for further resource assessment in updating the existing maps and identifying restoration needs], production, marketing, trade and investments that have or have not had significant impact. b). Identify land use changes, if any, linked with the evolution of gum tree areas in the last 20 years, c) review programmes/ projects/ activities of key actors involved in the management of the resource, production, processing and trade of gum arabic per country and identify good practices and investment opportunities.

2. Collect, using official government records, the overall countries production of gum arabic per species type, the quantities stored as strategic or buffer stocks (if any), the quantities consumed locally, data from Customs on Gum Arabic regional trade or cross border trade (or transiting exports) and the total

quantities exported (and to which country) in the last ten years and price or value of exports. The collected data shall be cross-checked with data to be gathered from markets records, forests administration records and wholesalers and exporters data.

3. Identify and profile type of gum Arabic traded by each of the different actors' from producing areas based on different species in the country.

4. Delimit and gather data to appraise the gum Arabic value chain (functional analysis, market analysis, and micro-economic data): Identify and describe the roles of key players in gum Arabic value chain including volumes traded along the value chain and benefit sharing based on interviews, bibliographic research and technical expert meetings (as outlined by the EX-ACT data collection guidelines and questionnaires provided);

5. Gather elements of social and gender analysis: Gather data to highlight the role of women/youth/disadvantaged groups, and conduct poverty and vulnerability assessment, and recommend strategies for empowerment

6. Conduct an economic and SWOT analysis: Assess the existing capacity in the gum Arabic sector in terms of value addition and markets in the countries, highlighting issues, opportunities and challenges;

7. Carry out a review of existing national policies and institutional frameworks relevant to gum Arabic in the country;

8. Identify avenues to strengthen the sector: Recommend areas for investment in each country (based on situational analysis), such as producers organizations, processing, warehousing, quality control, and identify the training needs to upgrade the knowledge and skills of women and youth with respect to improved tapping, collection, handling, quality assurance, in addition to improved storage and marketing. These will be aggregated to create a GCF ready investment proposal on diagnostic and what actions could be financed under the project to strengthen the value chain and its actors for a more equitable, gender sensitive, profitable enterprise.

2.0 Methodology

2.1 An overview on the methodology

During the Kumasi workshop each of the tasks was discussed and harmonized methodologies with regard to activities, expected results and time frame agreed by each of the partners from which a work plan was generated. Details for the FAO-NGARA Programme are presented in the sections that follow.

2.2 Methods and approaches in each key result areas

Each of the tasks, activities, deliverables and time frame are captured in the revised harmonized work plan and implementation schedule presented in section 2.3. The teams of experts including process of hiring, their TORs and the work done are reported in section 2.4.

The sites for implementation of the FAO-NGARA studies are presented in Annex 1.

2.3 Revised Work Plan and Implementation Schedule

Task	Activities	Deliverable/Result	Timeline
1. Prepare an agreed concept note & work plan	Discuss and agree on concept note with clear activities & methodologies for implementing the tasks	Inception report with reviewed tasks, activities & agreed work plan	March 2020
2. Conduct literature reviews to: a). generate information on the status of the resource base, productivity, conservation/management status, potential areas of production, production, marketing & trade b). Identify land use changes, if any, linked with the evolution of gum tree areas in the last 20 years,	2.1 Literature review on the status of the resource base, productivity, conservation/management status, potential areas of production, production, marketing & trade	A report on the resource base, productivity, conservation/ management status, potential areas of production, production, marketing & trade	March – April 2020
	2.2 Review status of land use changes based on review of NAPAs https://unfccc.int/topics/resilience/workstreams/national-adaptation-programmes-of-action/introduction , National Communications to UNFCCC available online) https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/national-communications-and-biennial-reports--annex-i-parties/submissions/national-communications/fifth-national-communications	Report on existing maps and agro-ecological shifts due to climate change and variability	March – April 2020
	2.3 Review and appraisal of existing	Report on existing programmes/ projects/ activities of key actors involved in the	March-April 2020

c) Identify programmes/ projects/ activities of key actors involved in the management of the resource, production, processing and trade of gum Arabic; good practices and investment opportunities.	programmes/ projects/ activities of key actors involved in the management of the resource, production, processing and trade of gum Arabic; good practices and investment opportunities.	management of the resource, production, processing and trade of gum Arabic; good practices and investment opportunities.	
3.0 Collect overall countries production of gum arabic per species type, quantities stored (buffer stocks, if any), quantities consumed locally, trade or cross border trade and total quantities exported in the last fifteen years and value of exports.	3.1 Review published literature from national reports 3.2 collate data from relevant government agencies – forest services, customs, Bureau of statistics, traders/exporters over the period on local consumption & export data 3.3 collate data on national and international trade and markets	Report on status of national production, local consumption and export Report on national and international trade and markets	March – May 2020 for country experts July – August for experts on trade and markets
4.0 Identify and profile type of gum Arabic traded by each of the different actors' from producing areas based on different species in the country.	4.1 Collect samples of commercial gums by species & variety where applicable & take photos of tree/samples of gums 4.2 Submit samples to NGARA Secretariat for analysis	A report on physical description of gums & tree species A report on physical description chemical characteristics	September - October 2020 November 2020
5.0 Delimit and gather data to appraise the gum Arabic value chain (functional	5.1 Map key stakeholders and roles by each involved in the value chain of Gum Arabic from collection to	Report on key stakeholders and their roles in the value chain	July - August 2020

analysis, market analysis, and micro-economic data): Identify and describe the roles of key players in gum Arabic value chain including volumes traded along the value chain and benefit sharing (as outlined by the EX-ACT data collection guidelines and questionnaires provided)	marketing 5.2 Analyse value chains including volumes traded from collector to exporter & describe benefit sharing mechanisms based on EX-ACT tool	Report on price trends along the value chain and benefit sharing arrangements Summarized table showing cost & income of each gum at each level of the value chain Value chain flow chat from collector to exporter and/or processor	September - November 2020 to be reported by FAO Experts on EX-ACT tools
6.0 Gather elements of social and gender analysis: Gather data to highlight the role of women/youth/disadvantaged groups, and conduct poverty and vulnerability assessment, and recommend strategies for empowerment	6.1 Collect data on women/youth/disadvantaged groups in regard to poverty levels & vulnerability using the EX-ACT tool 6.2 Develop strategies for empowerment	Information on women/youth/ disadvantaged groups in regard to poverty levels & vulnerability Recommendations on strategies for empowerment	September – November 2020 September – November 2020
7.0 Conduct an economic and SWOT analysis: Assess the existing capacity in the gum Arabic sector in terms of value addition and markets in the countries, highlighting issues, opportunities and challenges	7.1 Carry out a SWOT on the existing capacity in the gum Arabic sector in terms of value addition and markets	Report on the SWOT highlighting issues, opportunities and challenges	July - August 2020
8.0 Carry out a review of existing national policies	8.1 Identify and review relevant policies, laws, and related	❖ Report on status of the policies and legislation and	July - August 2020

and regulations relevant to gum Arabic in the country	regulations including community by-laws 8.2 Identify the gaps and propose appropriate policies & regulations in the gum arabic sector	proposals on appropriate policy and legal frameworks	
9.0 Identify avenues to strengthen the sector: Recommend areas for investment based on situational analysis, such as producers organizations and related institutional arrangement, and identify the training needs to upgrade the knowledge and skills of women and youth	9.1 Profile and review existing institutional frameworks and arrangements (e.g. associations, etc.) 9.2 Carry out a Training Needs Assessment (TNA) 9.3 Review and update existing training materials	❖ Status of institutional framework and strategies for strengthening ❖ Report on training needs assessments ❖ Updated training curriculum	August 2020 October – November 2020
10.0 Support and contributions to the organization of expert meetings, consultations and partners events a) Expert Workshop in Accra b) SURAGGWA Kumasi workshop	i. Review activities of FAO-NGARA study on strengthening the gum arabic sector for sustainable and resilient landscapes & livelihoods of women and youth in Africa's drylands i. Train lead enumators on field data collection methods, baseline data and value chains analyses ii. Define Scaling-Up Resilience in Africa's Great Green Wall (SURAGGWA) Project	❖ Revised TORs for the project based on the EX-ACT value chain approach ❖ Enumerators trained in appropriate data collection methodologies and tools to facilitate value chain analyses ❖ Harmonized approach towards data collection and methodologies by FAO and	October 16-17, 2019 February 10- 14 2020

c) Organized a side event / participation at 22nd Session of the African Forestry and Wildlife Commission and the 6th African Forestry and Wildlife Week (AFWC2/AFWW62)	i. Share information and experiences among member countries, relevant UN & specialized agencies and observers on status of NGARA and forest/ including gum Arabic value chain value chains ii. Generate recommendations and awareness for the study among AFWC member countries and partners	regional partners Finalize ❖ Road map for the formulation of the funding proposal developed and agreed upon	March 9-13 2020
11.0 Final Narrative and Financial Report		Final narrative and financial reports with deliverables	December 2020

2.4 Establishment of the team of experts for implementation of the activities

Following signing of the FAO-NGARA LOA in September 2019 the NGARA Executive Secretary (ES) formally informed the NGARA Board about the LOA and was given a go ahead to prepare TORs for recruiting National Experts. The ES then contacted NGARA Focal Points (NFPs) in the beneficiary countries (Ethiopia, Nigeria, South Sudan, Chad, Mali and Senegal), where they exist or the Directors of Forest services for nomination of suitable officers and informed them of the advertisement of the consultancy on "Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa's Drylands" that had been posted on the NGARA website to advise suitable candidates to apply. The TORs for the National Experts are attached as annex 2a. Various candidates from beneficiary countries applied and after evaluation by the NGARA Board, the selected national experts are given in Table 2.4.1. Meanwhile NGARA is implementing a related project with AFF, which is generating comparable information on gums and resins and covering the four NGARA member countries of Burkina Faso, Kenya, Niger and Tanzania. During formulation of the SURAGGWA project which covers the six countries of Burkina Faso, Chad, Mali, Niger, Nigeria and Senegal, the national experts from Burkina and Niger were included as well as the expert from Kenya, which is also implementing a GEF-FAO project on related bio-enterprises. The TORs for the National Experts from the three countries are attached as annex 2b. Additionally, there is one task on business sector perspective that is examining national and international trade and markets. Two experts were identified based on previous work in the sector and requested to put in their bids. TORs on "Trade and Markets" are attached as annex 2c. Additionally, the NGARA Secretariat recruited the Knowledge Management Expert (annex 2d) and Administration/Accountant while the NGARA Board recruited NGARA ES as Regional Coordinator for the FAO-NGARA studies (annex 2e).

Table 2.4.1: Details of National Experts for the FAO-NGARA Projects

Name	Country	Qualification	Email address
Patrice Zerbo	Burkina Faso	PhD Applied Biological Sciences	patzerbo@yahoo.fr & patzerbo@gmail.com
Ahamat Mahamat	Chad	BSc Forestry and Water	ourbaoui@gmail.com
Wubalem W. Tadesse	Ethiopia	PhD in Forestry Genetics	wubalem16@gmail.com
Robinson K. Ng'ethe	Kenya	M.Sc. in Resource Management	robngethe02@yahoo.com
Jonas Diarra	Mali	MSc Forest Management	jonadiarra@yahoo.fr
Maisharou Abdou	Niger & Sub-regional Coordinator	MSc in Forest Sylviculture and Biology	maisharou.abdou2015@gmail.com
Fredrick Ojiekpon	Nigeria	PhD in Agronomy	ojiekponif@yahoo.com
Sakhoudia Thiam	Senegal	PhD in Environmental Sciences	thiamsak@yahoo.fr
Simon N. Dralley	South Sudan	MSc in Forestry Economics	dralley@gmail.com
Engr. Chidume Okoro	Regional/ International Expert	BSc in Mechanical Engineering PGD in Project Analysis and Management	gaconlimited@gmail.com
Mohammed El Mukhtar Ballal	Regional/ International Expert	PhD in Forest Management	mohamedballal@yahoo.com
Sheila Mbiru	Kenya & KM Expert	MSc Wood Science & B. Philosophy in Information and Knowledge Management	sheilambiru@gmail.com
Ben Chikamai	Kenya & Regional Coordinator	PhD Forest Utilization	bnchikamai@gmail.com

3.0 Results and Discussion

3.1 Status of the resource base, productivity, conservation/management status and potential areas of production

Information generated from a review of literature on production (species, areas, status of management and changes in resource availability) reveals that the main sources of gum Arabic of commerce in producer countries are *Senegalia (Acacia) senegal* and *Vachellia (Acacia) seyal*. However, there exist other commercial gums that are marketed as gum Arabic in some countries. These include *Senegalia laeta* and *Senegalia dudgeon* in West Africa and *Senegalia polycantha* in Eastern Africa.

In **Burkina Faso** most of the resources are found in three (3) provinces of the Sahel Region where production and marketing are the most abundant. These are the provinces of Séno with Dori as its capital, Soum with Djibo as its capital and Yagha with Sebba as its capital (Fig.3.1). The study conducted in 2016 by the Directorate General of the Environment, Green Economy and Climate Change had not given any indication on the total area covered by the gum resources in the three provinces (DGE/EV/CC, 2017). However, the total area of the gum resource in Burkina Faso is about 286 000 hectares of both natural and plantations (Zerbo, 2020). Detailed country report is given as annex 3a.

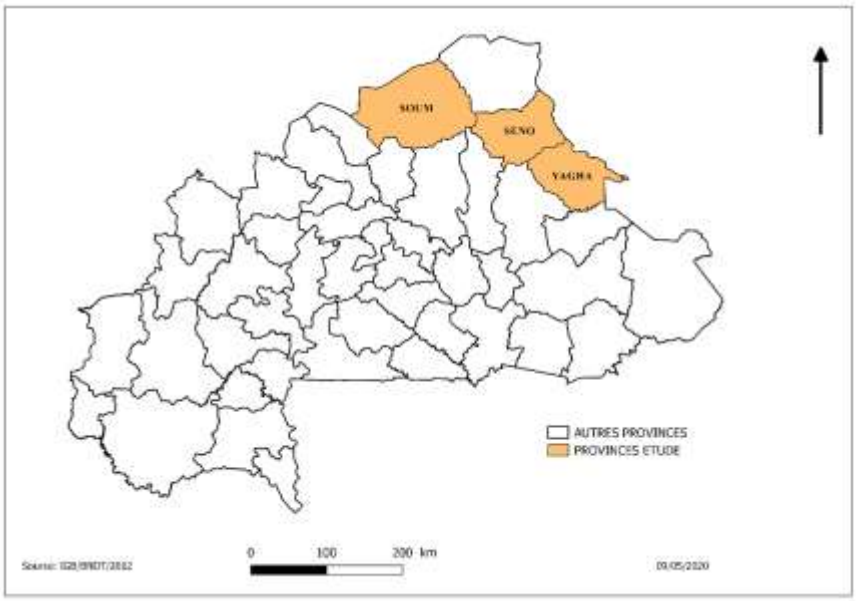


Figure 3.1: Location map of the study area in Burkina Faso (Zerbo, 2019)

In **Chad** areas of large production are Hajerlamis, Chari Baguirmi, Batha, Guera, Salamt, Sila, Ouaddaï and WdiFira (Fig. 3.2). Others areas include Mayo Kebbi,

Tandjilé, two Logones, Moyen Chari. Gum arabic is a natural exudation from several Senegalia species and also of other woody plant species. The best-known species producing species in Chad include: *Senegalia senegal, Vachelia seyal, S. millifera, S. laeta* (A. Bertrand, A. Ichaou, B. Krause, 2010). The gum stands consist mainly of *Senegalia senegal*, *S. laeta* and *Vachelia seyal*, are widely exploited in the Sahelian part of the country. The total cover area of gum trees is about 3.8 million ha, of which 1.5 million ha are suitable for sustained exploitation. The gum arabic production in Chad varies from one year to another with an average of 1,500 tons / year between the years 1986-1991 and an increase in production of 20,000 tons / year in 2006. Chad contributes around 7% of the world production depending on the years and ranks second after Sudan. Chadian gum arabic is marketed by private parties from production to export. It is estimated to bring in more than CFAF 20 billion per year, or 7% of GDP (DPFLCD, 2006). The production varies gradually and evolves in an increasing way in the GDP. Thus, 7.2% in 2012, 7.4% in 2013 and 13.5% in 2014 (BEAC, 2015 - Report from Chad contributing to the State of Biodiversity for Food and Agriculture in the World, Department of Wildlife Conservation and Protected areas, 2015). Country report for Chad is given as annex 3b.

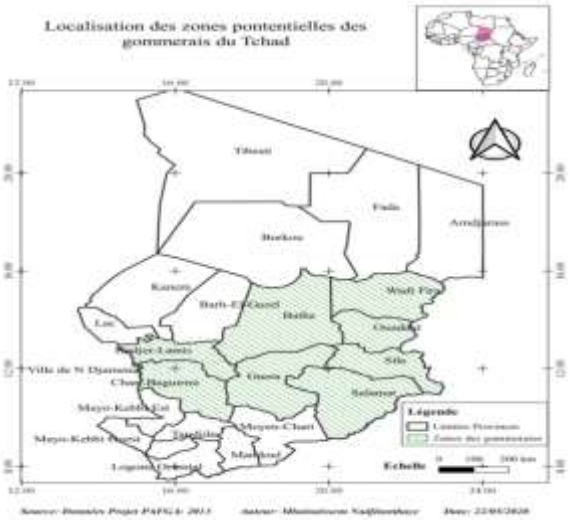


Figure 2.2: Potential areas of gums in Chad (Source: Donnes projet PAFGA, 2013)

In **Ethiopia** they are found in the Central Rift Valley Region, Southern (Borana) lowlands and Northwestern lowlands, especially Amhara, Tigray and Benishangul states (Figure 3.3).

The country has a large resource base for the production of gum arabic, although current production levels fall far short of the potential and its contribution to the world production is very little (Lemenih, 2011; Tadesse, 2007).

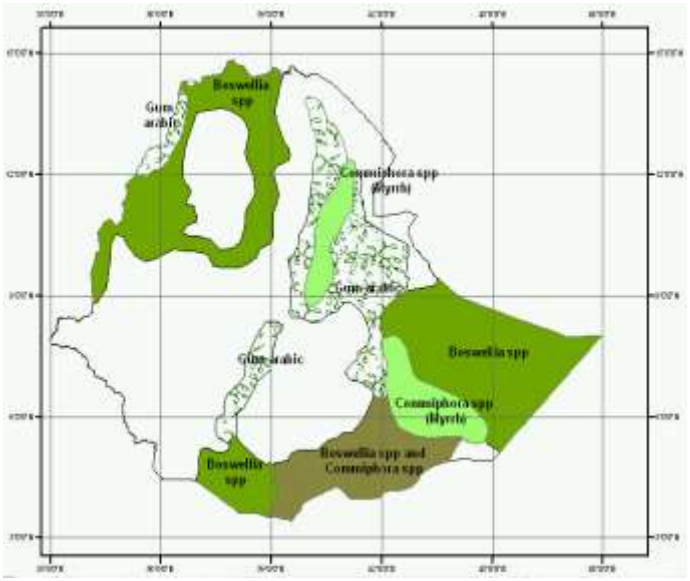


Figure 3.3: Distribution of natural gum and resin bearing species in Ethiopia (Source: Anonymous, ND)

Potential production area for gum arabic in Ethiopia is estimated at 399,700 ha. Estimated annual production of gum arabic in the country is 4,996 tonnes, of which 52 % of gum arabic is from *S. sengal* and the rest from *V. seyal* (Lemenih, 2011; Fitwi, 2000). The density of the gum arabic producing species of natural stands ranges between 31–947 stems/ha (sph) across various land use/land cover systems (Yebeyen, 2006) with a mean of 111 sph producing gum arabic yield of about 27.71kg per hectare per season, which is generally low.

Regarding management, Ethiopian dry forests are legally state properties and with low capacity of government institutions, hence proper management is limited. One of the major constraints for promoting sustainable management of dry forests and their valuable tree species is the lack of awareness of their importance combined with inadequate knowledge about sustainable production and marketing of their products (Lemenih and Kassa, 2011a). The gum arabic bearing species are suffering from mismanagement due to improper tapping. Gum collection is done with workers who are not properly trained on how to tap the trees. They do not have also access to proper tapping equipment. Country report for Ethiopia is given as annex 3c.

In **Kenya** the resources are found is seven counties of Turkana, Marsabit, Samburu, Isiolo, Garissa, Wajir and Mandera where the business has been (Figure 3.4). The forest areas are; Turkana 189,273 ha (4.8%), Marsabit 81,829 ha (1.1%), Isiolo,70,240 ha (2.8%), Garissa 258,497 (5.9%), Wajir 23,676 ha (0.4%) and Mandera, 42,816 (1.6%) (KFS, 2013). Based on the stocking densities, the potential gum yield of *Senegalia senegal* ranges from 50 to 337.5 Kg ha-1 (KEFRI, 2016).The gum Arabic potential has remained underutilized due to an interplay of factors including inadequate marketing arrangements due to limited organization and participation of collectors/producer associations and cooperatives which does not favour the efficient participation of the private sector (Wekesa et al, 2013). For example, the three cooperatives registered in 2013 in Isiolo, Marsabit and Wajir have not been fully operational due to organization and institutional challenges. Country report for Kenya is given as annex 3d.

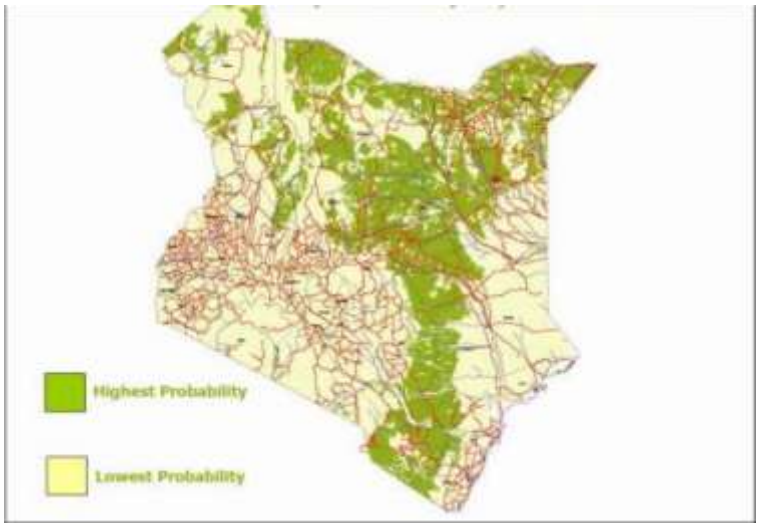


Figure 3.4: Probability map of gum and resin resources in Kenya (FAO, 2005)

In **Mali** the main areas are Kayes and Gourma Region (Mopti and Timbuktu (Table 3.5). The natural formations of *Senegalia senegal* producing gum arabic of first choice or "hard gum" are located in the following regions:

- the Kayes region, particularly the circles of Kayes in Guidimaga, Nioro, the north of the circle of Yélimané and a little Diéma towards Béma. The resource covers about 13,000 ha of highly dense stands with a density of about 100 plants/ha for an estimated gum arabic production potential of 3,000 tons.
- the Koulikoro region in the Nara circle and the region of Segou in the North of the circle of Niono,
- the region of Mopti in the western Gourma between Douentza and Bambara Maoundé as well as the Timbuktu region (Gourma Rharous, Niafunké, Diré and Goundam) and on the Dioura side. In this area first quality stands were estimated at 1,150.2 ha out of a total of 4,200 ha during the November 2002 inventory.
- the region of Gao (Ansongo, Bourem, Ménaka and Gao) as well as the region of Segou (circles of San, Bla Segou, Niono) though no inventory has been carried out.

Meanwhile, *Vachellia seyal* covers large areas in the Segou, San, Tominian and Niono circles where it occurs as scattered stands with patches that are more or less dense in some places. Country report for Mali is given as annex 3e.

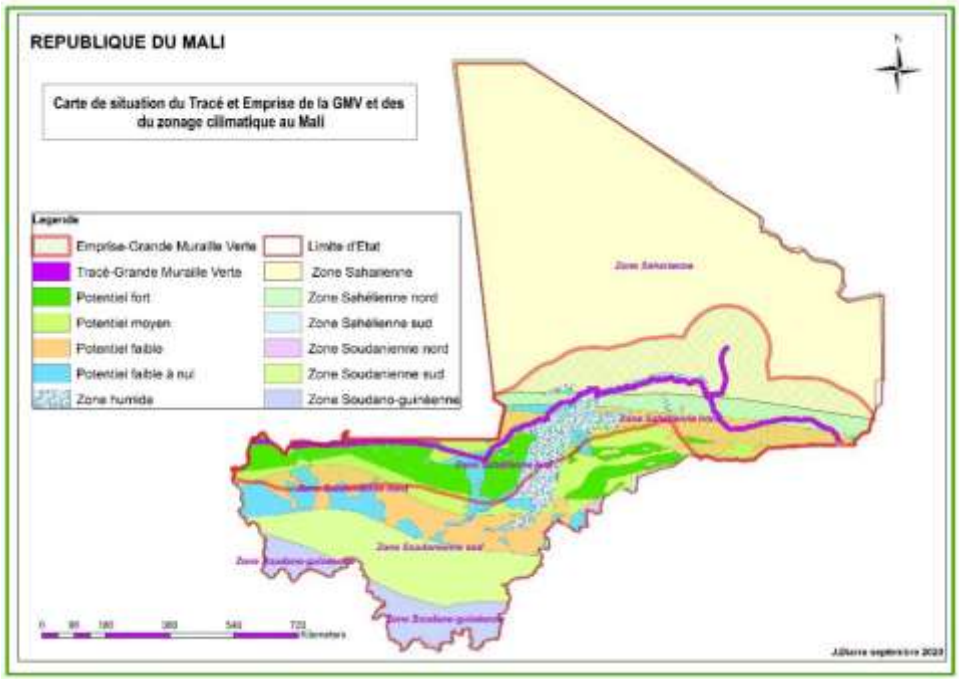


Table 3.5: Potential areas for the production of gum arabic and resins in Mali

Gum arabic resources in **Niger** are found in three basins: Eastern basin made up of the Diffa and Zinder regions; the Central basin made up of the regions of Maradi and Tahoua and the Western basin made up of the Dosso and Tillaberi regions (Figure 3.6).

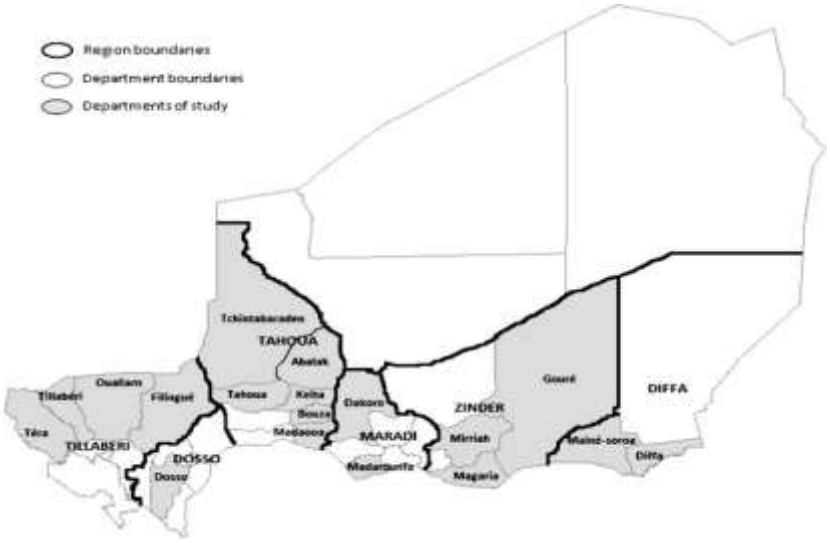


Figure 3.6: Location map of the different gum Arabic production basins in Niger (Source: Aichatou Assoumane et al. 2009).

Production potential in the Eastern basin is estimated at 200,000 hectares of natural stands (or 15 million trees), of which almost half (98,000 hectares) consists of classified forests (State domains). The main production species are *Senegalia senegal* and *S. laeta*. The annual potential production of this basin, at an average productivity of 150g per tree per year, is about 2,250 tons. The Central basin has about 50,000 hectares (approximately 3,750,000 trees) of natural *S. senegal* stands and large artificial plantations evaluated at about 7 million trees of *S. senegal* and *Vachelia. seyal*. The annual potential production of the central basin, on the basis of the average productivity of 150 g per tree per year, is estimated at about 1,612 tons. The Western basin has natural forests estimated at approximately 40,000 hectares (approximately 3,000,000 trees), consisting of a mixture of *S. senegal* and *V. seyal* and important artificial plantations of nearly 500,000 trees of *S. senegal* and *S. laeta*. The annual potential production of this basin is around 525 tons. The remaining 10,000 hectares are made up of *S. senegal* stands associated in agroforestry in the 3 production basins.

Niger is also a major producer of Combretaceae gum. The production potential of the Combretaceae gum is estimated at more than 800,000 hectares of

classified/protected forests, located mainly in the western basin which includes the regions of Dosso and Tillaberi (Ichaou, 2008). The densities of these stands vary between 20 to 30 exploitable trees per hectare. The Rural Municipality of Torodi alone represents about 100,000 ha of stands of Combretaceae. They are mainly distributed in the Gourma and Sirba water basins, and to a lesser extent, in the Goroubi water basin. The annual production potential is estimated between 2,400 to 12,000 tons of gum per year (Ichaou, 2008).

The major constraints related to the production of gum Arabic are, among others: (i) aggressive tapping techniques which promotes the degeneration of gum trees; (ii) competition with agricultural (clearing) and pastoral activities (bush fires, overgrazing, cutting fodder, etc.); (iii) land clearing linked to the increased use of wood, (iv) overexploitation of certain easily accessible areas; (v) inaccessibility of areas with high gum potential due to a lack of road infrastructure; (vii) lack of water points and the insecurity currently plaguing certain production areas, and (viii) the climate change impacts. Country report for Niger is given as annex 3f.

In **Nigeria** the resources are found in the Sudan and Sahelian ecological zones stretching from Borno/Adamawa states in the East to Sokoto/Kebbi states in the West (Fig. 3.7). The estimated hectarage of gum arabic for both cultivated and the wild forms (forest reserves) are 2.5 million (ha) while the cultivated type at 1,881 ha. Though the country has good potential in production of gum arabic, productivity is generally low, estimated at 0. 2 tons/ha. Country report for Nigeria is given as annex 3g.

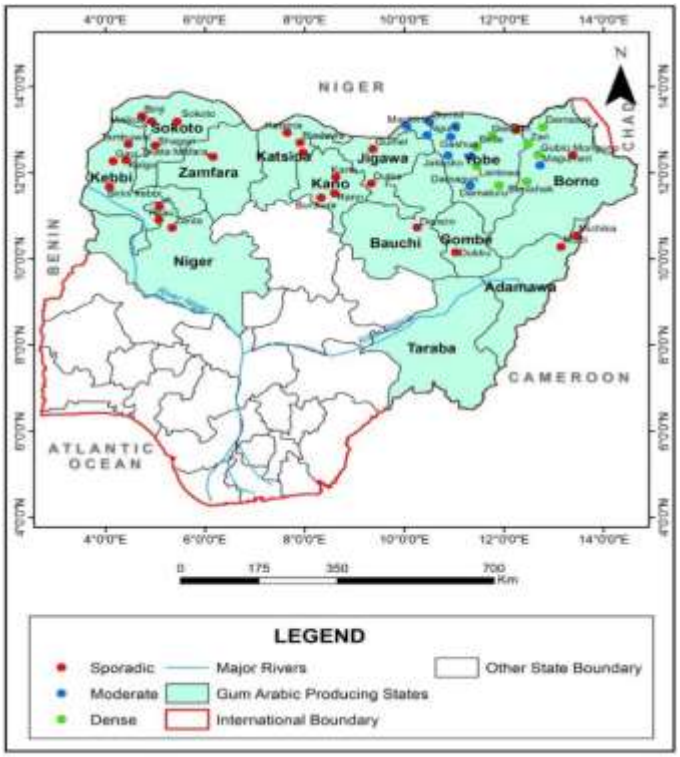


Figure 3.7: Map showing limit of occurrence of natural stands of gum arabic in Nigeria

In **Senegal** the production potential for gum arabic consists of:

(i) The natural gum forests or stands observed mainly in the regions of Louga, Saint Louis, Tambacounda, Kédougou and Matam. The national inventory of the production basins conducted by the Program for the Sustainable and Participatory Management of Traditional Energies and Substitution (PROGEDE) provides maps (Fig. 3.8a and 3.8b) that show the production potentials of three major gum arabic species of *S. senegal*, *Vachelia. seyal* and gum karaya species of *Sterculia setigera*;

(ii). The plantations of *S. senegal* as the result of the afforestation or /reforestation projects implemented by the Directorate of forestry, mostly located in Ferlo areas for improving the production potential of gum arabic. However, plantations have sprung up in recent years and have started to gain momentum especially with the private sector such as Asiyla Gum Company.

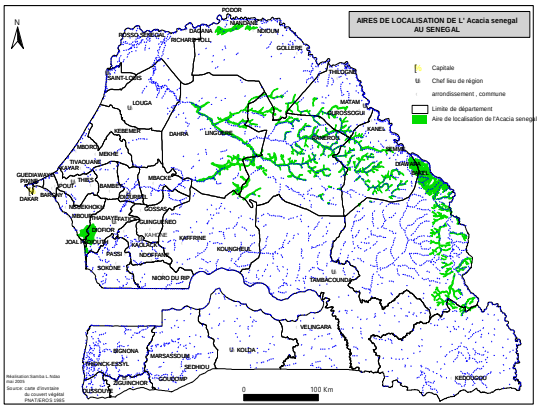


Fig. 3.8a: Map of *Senegalia senegal* distribution

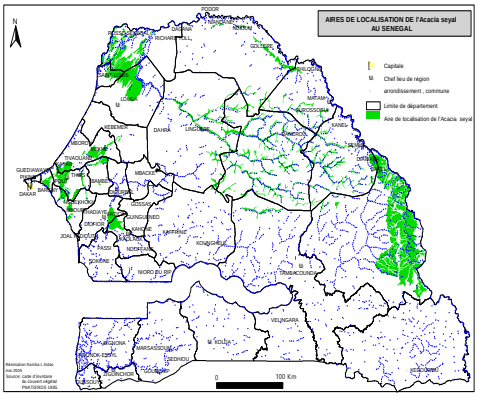


Fig. 3.8b: Map of Vachelia *seyal* distribution

Whereas the potential for the production of gum arabic accounts about 55 850 791 trees of *S. senegal* and 154 175 578 trees of *V. seyal*, the same source i.e. (PROGEDE) indicates very weak natural regeneration. This raises the question of the long-term survival of these stands in the absence of radical measures to promote natural regeneration management (bush fires' control, reforestation, etc.). Country report for Senegal is given as annex 3h.

The gum belt in **South Sudan** runs across from former Eastern Equatoria State (EES), Central Equatoria State (CES), Northern Bahr El Gazal State (NBGS), Warrap State (WS), Unity State (US), Jonglie State (JS) to Upper Nile State (UNS). Resource assessment has been carried out in at least 3 key gum producing states namely: Upper Nile State (UNS), Eastern Equitoria State (EES) and Northern Bahr el Gazal State (NBGS) and yet to be accomplished in 4 remaining potential gum Arabic producing (Figure 3.9). The estimated area under gum acacia resources in the three states is 4,596,342.5 ha with an annual gum production potential of 25,721.9 MT, with *V. seyal* being more abundant and widespread. It was estimated to cover 2,709,117.7 ha (58.9 %) with an estimated production potential of 20,498.2 MT (79.7 %). *S. senegal* covers an estimated area of 1,887,224.8 ha (41.1 %) mainly in UNS and EES with a potential production of 5223.7 MT (20.3 %) per year. With adequate support and proper tapping, the potential yield of *S.senegal* can go up between 20 -74% depending on age. (Wekesa,2010). Country report for South Sudan is given as annex 3i.

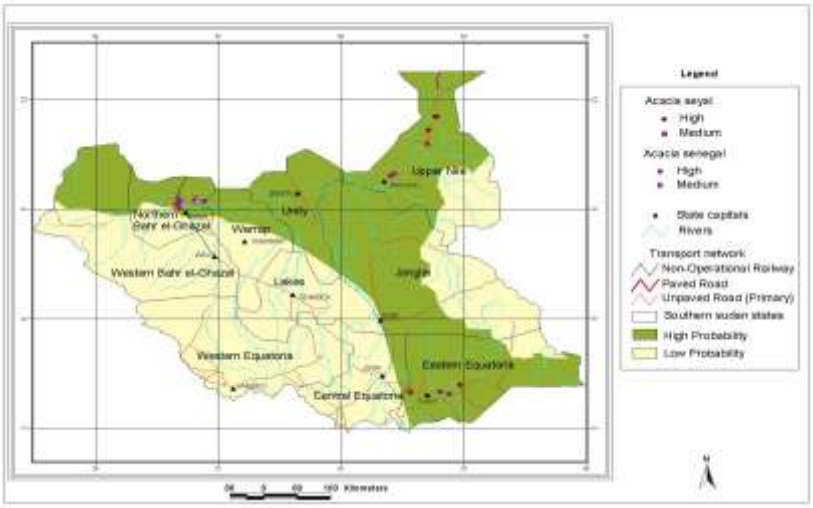


Figure 3.9: Probability map showing gum resources in Southern Sudan (Source: SNV, 2009)

3.2 Agro-ecological shifts due to climate change and land use changes linked with the evolution of gum tree areas in the last 20 years

There is evidence of climate change impact on the population of the gum resources in most of the produding countries. For example, natural stands of *S. senegal* in **Burkina Faso**, which were estimated at 15 million stands according to the first national forest inventory (Nikiéma et al., 1997) in 24 provinces that is, the entire northern strip from Banwa province to the west, to the province of Tapoa in the east of the country, are now estimated at about 10 million stands according to the results of the second national forest inventory (IFN2, 2018) and in only (7) regions, namely the Sahel, Boucle du Mouhoun, the North, the Center-North, the East, the Center-West and the Central Plateau. There is therefore a reduction in the population of the trees in the country. The same is true for other species (*S. dudgeoni; S. laeta; V. seyal*), which have also experienced a decrease. This situation is attributed to the decrease in rainfall and hence the effects of climate change. During these two decades, the area has experienced a significant decrease in water quantities (MAAH, 2017) and probably the old age of the trees. There is no evidence on the occurrence of dieback. There is however, also evidence of anthropogenic causes due to deforestation for fuel wood and charcoal burning. Overgrazing, especially in the Sahel north regions of the country were causes.

Further studies according to the 2020 report of the Permanent Secretariat of the National Council for Sustainable Development (SP-CNDD) and the Coordination

of Agricultural Sectoral Policies (SP-CPSA) have confirmed that the causes of shrub area loss, deforestation and land degradation are a combination of climate change and human actions.

Indeed, climate change and its effects are a reality in the region and populations observe them from the significant variations in rainfall and temperatures over time. All regions of the country are subject to the effects of climate change, which is manifested among other things by the decrease in rainfall levels towards the south of the region. These effects can also be observed by the evolution of isotherms in the region. Over the years, there has been an increase in the heat, where the average temperature of 29°C which was in the Dori area (Sahel region) between 1971 and 2000 was experienced in the Ouahigouya area (Region of North) between 1980 and 2009. At the same time, the average temperature of 28.5°C which was in the Passoré area (North Region) went further south to Dédougou and Boromo (Boucle du Mouhoun).

As for anthropogenic actions, Table 3.1 summarizes trends in land degradation over 11 years, between 2002 to 2013 in the regions where there are many gum-bearing species. This is the latest information available.

Table 3.1: Trends in land degradation from 2002-2013

Region	Land use **	Land productivity	Restored Areas	Overall degraded areas (km²)	
Centre-North	0,78%	12,26 %	0,51%	2 658	139,54%
East	1,05%*	5,51%	0,79%	3 434	7,35%
North	1,81%	47,4%	-	1 070	6,85%
Plateau central	9,52%	5,76%	-	1 314	15,28%
Sahel	3,46%	9 %	0,57%	5214	14,43%

Source: (SP/CNDD and SP/CPSA, 2020).

**: Land use: loss of shrub area and deforestation

*: Deforestation only

Meanwhile, many gum trees exhibit low productivity. This situation is mainly due to the old age of the trees and their vulnerability to the reduction of the amount of rainfall, therefore attributable to the effects of climate change. Indeed, rainfall and temperature are the two major climatic parameters that have the greatest impact on gum resources, and the main factors that affect gum resources due to their evolutionary trend and especially their inter-annual and intra-seasonal variability in the study areas. During the last two decades, the area has experienced significant decrease in rainfall quantities (MAAH, 2017).

Studies **in Ethiopia** have shown that the Acacia-Commiphora woodlands are currently under strong environmental stress with woodlands in the Rift Valley resulting from declining and erratic rainfall, which is excarbating degradation through human activities of cropland expansion, overgrazing, and unsustainable fuelwood harvest and charcoal making (Lemenih and Kassa, 2011; Tadese et al., 2018). Further studies in Kaftahumera in the Northwestern part of Ethiopia for the period 2000 to 2010 demonstrated that the woodland lost 36.62 % of its land cover and changed to other land use types, especially to crop land. A climate study (Burru, 2020). showed that mean minimum and maximum annual temperatures have risen during 1983-2013 where both the minimum and maximum temperature of the region shows significant increase in annual trend. Tmax shows an annual increase of 0.04 °C while Tmin shows an annual increment of 0.03 °C. Similarly, results showed there has been a warming trend in the annual minimum temperature over the past 55 years with an increase of about 0.37 ^{o}C every ten years in Ethiopia as a whole. The increase in both Tmax and Tmin has an effect on the available moisture, which is very crucial for dryland vegetation growth. In Metema district located in the North western Ethiopia studies have revealed increased trends of conversion of wood land to agricultural land. As a result, the share of agricultural land increased from 24.13% in 1985 to 42.21% in 2010 while the wood land cover diminished from its level of 28.46% to 16.66% in 2010 (Alemu et al., 2015).

Recent studies have shown further that annual precipitation, precipitation of warmest quarter and mean temperature of coldest quarter are the main factors dictating the ecological needs of the species (Burru, 2020). Based on these studies' potential distribution places for gum arabic bearing species have been identified. These are; North Gondar, North Wollo, South Wollo, North Shoa, Wag Hemira, Central Tigray, Eastern Tigray, South Tigray, Asosa, East Shoa, Arsi, Borana, West Shoa, West Harerghe, East Harerghe, Harari, Afar (Zone 3), Afar (Zone 5), Dire Dawa, Shinile, Jigjiga, Liben, Guraghe and Kembata-Alaba-Tembaro (Fig. 3.10).

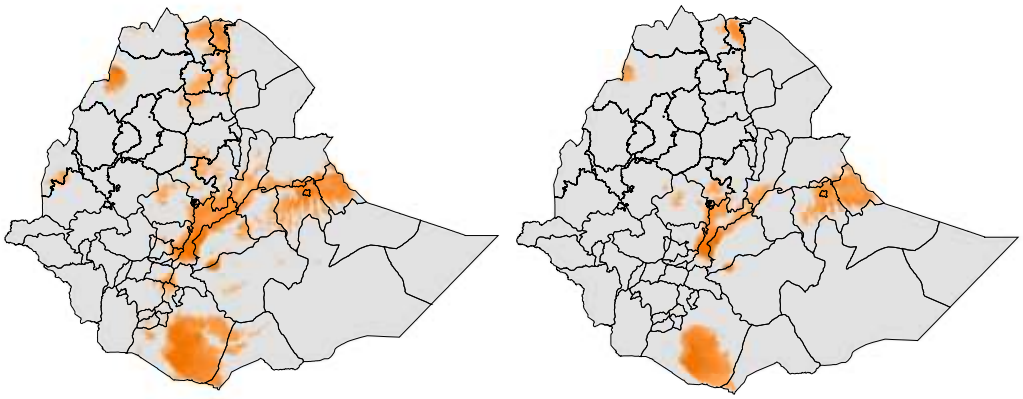


Figure 3.10: Current (Left) and Future (Right) potential distribution areas of gum arabic bearing tree species in Ethiopia (Burru, 2020).

In Niger, there is also evidence in the shift of the gum belt southward due to climate change. Studies by Ozer et al (2005) presented a comparison of isohyets during the so-called "wet" period from 1950 to 1967 and the drought period from 1968 to 1985, which highlighted the generalized decrease in rainfall marked by a significant retreat of the isohyet curves towards the south for about 200 kilometers (Fig. 3.11).

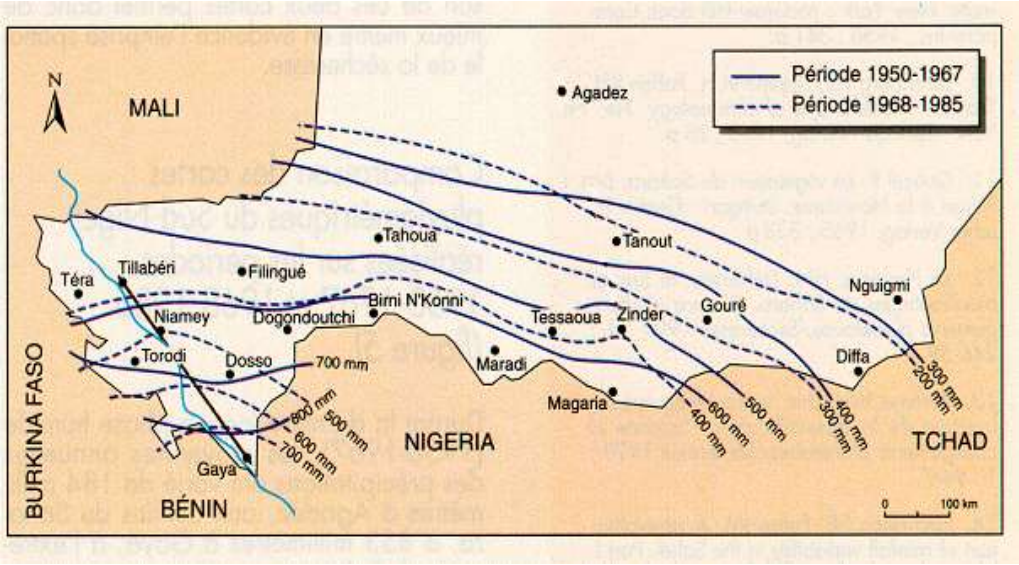


Figure 3.11: Rain map of southern Niger. The isohyets calculated over the so-called "wet" period (1950-1967) and the drought period (1968-1985) (OZER & ERPICUM 1995) reported by OZER *et al* (2015).

It can be noted from Figure 3.11 that the 400 mm isohyet curve of the dry period (1968-1985) is practically superimposed on that of 600 mm of the wet period of 1950-1967, which underlines the importance of the climatic change over the years 1970 and 1980 of the great drought. Also, several rain-growing areas (northern limit of 300 mm) have turned to pastoral areas. Additionally, significant rainfall deficit, have increased anthropogenic pressure which seems to be the real driver of the degradation of natural resources. Another main factor identified includes the collection of wood and charcoal production for cooking, the cutting of timber, gathering of wood for firewood and services as well as collection of fodder. The effects of these strong human settlements on the wood resources are reflected in the creation of deforestation rings whose radius increases each year, the loss of biodiversity, formation of bare soil which promotes wind and water erosion (Mahaman Abdou, 2019).

Meanwhile, a recent study conducted by Mahaman Abdou (2019) has highlighted the impact of heavy anthropogenic activities on the scarce wood resources of the area due to the settlement of displaced persons and refugees who are victims of the Boko Haram crisis. The main activities include; wood collection and charcoal production for cooking, cutting of timber and fodder collection. The effects of these strong anthropogenic activities on woody trees are increased deforestation whose radius increases each year, the loss of woody diversity, and formation of bare soil, which favours wind and water erosion. An analysis (2013-2017) of the land use units in the commune of Gouré has revealed a regression of the shrub steppe and forest areas and an extension of degraded shrub steppes and bare soil which results in two (2) distinct levels of change: decrease of 6.5% of the shrub steppe, 0.27% of the forest, 8.96% of the rain fed cultivated areas and 0.79% of the market gardening areas; an increase in the area of 10.64% of degraded shrub steppe, 3.99% of bare soil, 1.03% of residential areas and 0.66% of riparian cord.

In **Nigeria** forest is reported to be disappearing at an alarming rate. Only 50% of the forests that existed in 2007 remained 10years later. The other 50% had been converted to croplands (41.7%) of the pre-existing forest area) and other land (8.3%). At this pace, there is considerable risk that forests could disappear from the intervention area. Grasslands and wetlands were also being heavily encroached. Of the grasslands detectedin 2007, 78.3% remained, with most of the remainder (13%) of pre-existing grasslands) converted to croplands. Of the wetlands that existed in 2007, (62.5%) had been converted to other land uses. Of the total area in 2007, 37.5% had been converted to croplands and (25%) had been converted to grasslands. A considerable number of trees occurred outside forests, mostly (80.9%) in croplands. About 6.2% of trees outside forests were in settlements. An estimated 5, 431, 263 ha (57%) of the total area of Sokoto, Bauchi and Jigawa states) was in need of restoration in the intervention area (Sacande et al., 2018)

Nevertheless, due to the role gum arabic trees play in combatting desertification and restoration of degraded lands, several local and internationally funded tree planting programmes have included the tree species among for planting in Nigeria. Most of the projects are implemented through the state ministries of agriculture/environments and Rubber Research Institute of Nigeria. Some of the funding agencies are NAGGW, IFAD, NAGAPPEN, World Bank, FAO, etc. The Action Against Desertification (AAD) project implemented by FAO with partners and funded by EU-ACP is planting gum arabic and other trees and other species in some selected states in the two regions by supporting one local community

each in Sokoto, Jigawa and Bauchi states in the sustainable management and restoration of their fragile agro-sylvo-pastoral ecosystems affected by desertification, land degradation and drought.

In Senegal the degradation of gum tree stands is affected by climate change (10%), declining rainfall (5%), cutting by transhumant herders (45%), use for combustion (15%), aging (10%), and changes in land use for agriculture (15%). The impossibility of regeneration of *S. senegal* following dry years, has strongly affected the production and export capacities of gum arabic under the label "Ferlo" from Senegal, highly prized worldwide, compared to its competitor the "Kordofan" from Sudan. In addition to climatic hazards, the cutting of gum trees in the sylvopastoral zone by pastoralists and the continued practice of extensive agriculture in southern Senegal, have greatly contributed to the degradation of forest resources, including stands of *S. senegal*.

To reduce Senegal's foreign exchange losses, following the drop in exports of the internationally prized "Ferlo" label, several research activities have been carried out either on natural gum groves or on gum plantations. The 1970s, marked by repeated droughts, opened up the era of forestry afforestation projects with the plantation of gum tree, so the main objective was to restore the disturbed equilibrium of the ecosystems and improve the local economy, through massive production and export of gum arabic.

3.3 Mapping and review of programmes, projects, activities of key actors involved or potential partners in the gum sector

There are various projects that have been undertaken and/or are being undertaken in the beneficiary countries as briefly presented in Table 3.2.

Table 3.2: Programmes/projects, activities of key actors involved or potential partners in the gum sector being undertaken in the beneficiary countries

Country	Programme/Project/Funding Source	Activity	Budget	Implementer/outcome in blue colour	Period
Burkina Faso	i. MEEVCC ii. PCESA	• To support the State in strengthening the capacity of its decentralized technical structures in order to: ➢ Collect and process statistical data on gum arabic in order to make them available to users. ➢ identify, characterize and measure the surface area of gum tree stands ➢ Assess the condition of the stands and the available infrastructure ; ➢ Select or introduce through the CNSF, the best species of S. Senegal ➢ Set up a guarantee fund at the level of two banks, CORIS BANK INTERNATIONAL and ECOBANK. ➢ to set up a Green Fund of 2 billion FCFA in order to pursue the policy of planting and renewal of stands, the search for better species of S. senegal			
Chad	i. Support Project for the Gum Arabic Sector supported by EU, Tchad, AFD ii. Gum Arabic Trade Capacity Building Project in Chad supported by Enhanced Integrated Framework Trust Fund, Government of Chad, UNDP and the Actors in the Sector	➢ fight against desertification poverty and food insecurity ➢ diversification of the national economy and the reduction of poverty, particularly in rural areas	€4.500.000 €2,999,994,	➢ Ministry of Environment & Water Resources ✓ The socio-economic characteristics of the gum arabic sector are better known; gum arabic sector is better structured;Gum production is increased; quality of the gum arabic produced is improved. ✓ The gum is exploited in a rational and sustainable way, the producers master the techniques of production and sustainable exploitation.	2008-2013

				✓ Grassroots actors are better organized and play an active role in the functioning and development of the sector. ✓ Distribution channels are better structured and organized (supply better regulated) ✓ The products put on the market are better valued, competitive and resourceful	
Ethiopia	i. Ethiopian Environment and Forest Research Institute (EEFRI) supported by government - Developing tapping techniques for optimum gum and resin production from economically important tree species in dry woodland areas (Metema & Yabello) of Ethiopia ii. FAO-GGWSSI (under AAD project) supported - Integrated landscape restoration and livelihood development project in selected arid and semi-arid Wereda's (Metema, Raya Azebo, Gulina) in Ethiopia. Funded by EU	➢ Assess the nature of resin secretion and response to tapping ➢ Enhance restoration of ecological balance, conservation, recovery of plant and animal biodiversity ➢ Increase coverage of local needs for forest products (wood and fire service, NWFPs)		Ethiopian Environment and Forest Research Institute (EEFRI)	2014 - 2017 (Extended to 2020). 2016-2020
Kenya	i. GIZ supported - Increasing Employment and Economic Opportunities for the communities in Kenya's ASAL Counties (Samburu, Marsabit and Turkana) through Unlocking their Gum Arabic potential	➢ Carry out a value chain analysis to map out key stakeholders involved in the value chain of Gum Arabic in the 3 counties ➢ Explore and identify opportunities for value addition including product development for Gum Arabic in the country ➢ Carry out a TNA & develop manual for training 200 TOTs and collectors	€676,980	Acacia EPZ, KEFRI and consultants	July 2019 – Nov 2020
	ii. Sida supported - Integrated Management of Natural Resources for Resilience in the ASALs (IMARA) – Marsabit, Samburu, Isiolo & Laikipita Counties	➢ streamline operations of the gums and resins sector through development of the value chains and access to markets	US$ 1 Mn (estimated for gums and resins)	World Vision and Northern Rangeland Trust (NRT)	July 2018 – July 2021
	iii. Swiss Agency for Development Cooperation (SDC) through the African Forest Forum (Turkana,	➢ Identify key actors and their role in the production and trade of gums	US$256,000	➢ Database of key players in	June 2019 –

	Marsabit, Isiolo & Wajir Counties) - Strengthening capacity among stakeholders for the production and trade in gums and resins in Africa	and resins with focus on women and youth ➢ Review the distribution of gums and resins producing species, profile production potential areas and update existing maps and estimate the production potential of gums and resins for selected sites ➢ Identify and profile types of gums and resins exploited/traded by each of the different actors ➢ Undertake value chain analysis on gums and resins at country level, in addition to assessing their marketing and trade ➢ carry out a review of existing national policies and institutional frameworks relevant to gums and resins		the sector and roles ➢ Resource maps and production potential established ➢ Standards and QC of commercial gums and resins developed ➢ Value chain of gum Arabic streamlined and benefit sharing mechanism developed ➢ Enabling environment for gums and resins sector put in place	December 2021
	iv. FAOKE supported - Restoration of Arid and Semi-Arid Lands (ASALs) of Kenya through Bio-enterprise Development (Marsabit, Samburu and Laikipia Counties)	➢ Restore deforested and degraded lands through the Forest Landscape Restoration (FLR) approach and enhance the socioeconomic development of local communities through the development of bio-enterprises of Non-Timber Forest Products and Services (NTFPS) in ASALs including gums and resins	US$676,239 (Budget on bio enterprise development)	FAO, KEFRI, NRT, Laikipia Wildlife Forum (LWF), National Museum of Kenya (NMK). Expected outcomes; ➢ strengthened national & county level policy and regulatory frameworks to support FLR ➢ Strengthened institutional capacities and financing arrangements for large scale restoration	2019 - 2024
Mali	i. Project for the Strengthening of the Productive and Commercial Capacities of the Gum Arabic Sector in Mali – Supported by government of Mali in Kayes region	➢ reduction of poverty through production and trade (increase in income and improvement of the balance of trade ➢ rational exploitation of gum trees ensuring the preservation of the ecosystem ➢ reducing the rural exodus towards urban areas, neighbouring countries and especially the slowing down of	➢ $ 6 000 000 including 50% of the national counterpart over 05 years. 2013 – 2016 ➢ $5,511,942 Extension phase comprising	➢ Integrated Framework Implementation Unit in Ministry of Trade and Industry was the implementing entity with Director General of Trade as the National Focal Point. ✓ Revision of the gum arabic sector strategy ✓ Acquisition of 3MT seeds, nursery equip & trained 26	2013 – 2020

		migratory flows towards Europe ➢ organizing women in the gum-producing areas and strengthening their production and marketing capacities	✓ Multilateral Fund - $1,822,097 ✓ State budget - $3,689,845	nursery men to plant 10,000 hectares of gum trees ✓ 28 cooperative societies of gum collectors in Kayes ✓ 2 National Confederations - the National Confederation of Gum Producers (CONAPROGOM) and the National Confederation of Gum Collectors and Exporters (CONACOLEGOM). ✓ The creation of the Interprofession of the gum industry in Mali (IF-Gomme/Mali).	
	ii. Accelerated Economic Growth Program supported by USAID iii. European Union (EU), Global Alliance Climate Change Programme	➢ Increase income of rural households & percentage of the population no longer classified as extremely poor in the target areas ➢ Strengthen environmental governance systems and improve forest cover in the target areas	$116,071,430 $7,142,857 contribution from the Government of Mali of $702,811	➢ Ministry of the Environment and Sanitation and Sustainable Development ➢ The expected results are: ✓ R1: Communication and information in the field of climate change and forestry are improved. ✓ R2: The operational capacity of the FIS Unit is strengthened. ✓ R3: The Measurement, Reporting and Verification system is initiated. ✓ R4: Forest cover in the intervention communes is improved	2008 – 2012 2017-2023
Niger	Action Against Desertification	Capacity building of target municipalities with the restoration of degraded land, training of local actors and the enhancement of NTFPs	€1,500,000	➢ NAGGW ✓ 13 Communes; 13 000 ha of land restored ✓ support to 12 associations in the transformation of NWFP	10/1/2016 - 8/31/2020
	Climate Resilience Support Project for	Strengthening the resilience of	€11,000,000	➢ Directorate of Forestry	5/5/2015 -

	Sustainable Agricultural Development by European Union	populations in the face of climate change in support of the development of agro-forestry and pastoral production in the communes of the Dosso and Zinder regions		✓ 815 ha of degraded agricultural lands; 70 ha of degraded pastoral lands & 50 ha of dunes stabilized with 220000 trees; ✓ protection of land from envasive species over 10 ha; ✓ 1446 farmers trained in FANR/RNA, ✓ 1200 of pilot producers trained on Field Farmes schools ✓ 1845 women trained on improved stoves & alternative wood energy product kits	5/5/2020
	Great Green Wall Support Program by Global Mechanism	Strengthening gum ecosystems and producers' capacities in the production and marketing of high quality gum	€610000	➢ Directorate of Forestry ✓ Restoration & afforestation of 1000's ha of degraded gum stands; ✓ training >5000 people on gum trees' tapping and production and sale of 1000'tonnes of gum arabic	
	Sustainable Land Management Project in the Zinder and Diffa Regions by UNDP	Support protection of basins and oases against silting through the training of actors and the construction of palisades and reforestation, and the strengthening of vegetable production and the spreading of orchards to improve food and nutritional security	US$3825000	➢ Directorate of Forestry ✓ stabilisation of 400 ha of moving dunes; rehabilitation of 700 ha of staiized dunes, support to 10 farmers' associations for the production vegetables and establishment of	1/1/2020 - 12/31/2025
Nigeria	i. Research Institute of Nigeria (RRIN) project by the government - production of improved planting materials of *S. Senegal* ii. International Fund for Agricultural Development (IFAD) supported - uptake of grade one gum arabic seedlings for the establishment of	➢ germplasm collection of reproductive materials (seed) of *S. senegal* provenances ➢ Tree breeding of promising *Acacia senegal* provenances to F1 hybrids ➢ Production of certified seedlings ➢ IFAD purchased grade one gum arabic seedlings from RRIN to establish community based gum arabic plantations	$256,000 $312,000 $2,917,900 $2,802	Rubber Research Institute of Nigeria. Breeding to deveop Nigeria vaieties of gum arabic that combine, hiigh gum yield and quality IFAD. Economic empowerment of, rural populis Combating envronmmental degradation Federal government of	On-going since 1995 2009 - 2011

	community based gum arabic plantations iii. Gum arabic production inputs support scheme. Federal government providing support for procurement of critical production inputs and sales to farmers at highly subsidized rates.	➢ ➢ Procurement and sales to farmers at highly subsidized rates production inputs like cattle fencing wires, angle iron bars, gum storage bags, kibbling machines, moisture meter, colour sorters etc.	$3,311,000	Nigeria. Encouragement of gum arabic plantation establishment and development in the country. Remove bottle necks working against development of the sector. Reduction in cost of protection (fencing) of gum arabic plantation. Minimising rate of destruction of gum arabic plantation by herdsmen that feed their animals on gum arabic saplings and mature trees	On-going
Senegal	i. Programme for Strengthening Resilience to Food and Nutrition Insecurity in the Sahel - Fatick, (P2RS) Fatick, Kédougou, Kolda, Matam, Tambacounda and Ziguinchor zones funded by African Dev. Bank	➢ Fight against bush fires (opening and maintenance of firebreaks) ➢ Reforestation (plantations, defenses, CES/DRS); ➢ Collection and valorization of NTFPs	$34,821,570	➢ Ministry of Agriculture and Rural Development ✓ construction of water collection structures, 4 livestock markets, 6 vaccination parks, 6 mini dairies, 12 honey factories ✓ support for agricultural production on 30,000 hectares, promotion of non-timber forest products, reforestation and development of 4,730 hectares	2015-2019
	ii. The Regional Support Project for Pastoralism in the Sahel - Senegal (PRAPS-SN) - Linguère, Kanel, Bakel, Koumpentoum and Koungheul zones funded by World Bank	➢ Fight against bush fires (opening and maintenance of firebreaks) ➢ Reforestation (production of seedlings, plantations, RNA, defenses, CES/DRS) ➢ Collection and valorization of NTFPs ➢ Capacity building of local communities	$ 30 million	➢ Ministry of Livestock and Animal Production supported by; Senegalese Institute for Agricultural Research, Directorate of Water, Forests, Hunting and Soil Conservation ✓ Project still under implementation	2016-2021
	iii. Food Security Support Project (PASA LOUMAKAF) - Kaffrine, Louga and Matam communities funded by Global Agriculture and Food Security Program, African	➢ The opening of firebreaks in the regions of Louga, Matam and Kaffrine; ➢ Capacity building and equipment of bush firefighting committees in 25 Pastoral or Agro-Sylvo-Pastoral	➢ Global Agriculture and Food Security Program - $ 40	➢ Ministry of Agriculture and Rural Equipment supported by: Directorate of Water, Forests, Hunting and Soil Conservation, Ecological Monitoring Centre (EMC) & FAO ✓ The main expected achievements of the project	

	Development Fund & GoS	Units, 26 Farms and 17 lowland sites with hydro-agricultural facilities; ➢ The setting up of defences/assisted regeneration, reforestation and the creation of windbreaks on agricultural farms, market gardening perimeters and around new pastoral boreholes and hydro-agricultural installations in the regions of Louga, Matam and Kaffrine; ➢ The implementation of SWC/RSD activities in the project area for a better protection of hydro-agricultural developments ➢ Translated with www.DeepL.com/Translator (free version)	million ➢ African Development Fund - $ 2 million ➢ GoS - $ 5.87 million	are as follows (i) The development of 2,110 hectares of land, (ii) The organisation of 25 pastoral units centred on 18 boreholes, (iii) Construction of livestock infrastructure, (iv) The construction of 120 km of rural tracks and (v) Training and structuring of more than 30,000 producers.	
South Sudan	No on-going project in the forest sector. Only activity is that government formed a committee to establish South Sudan Gum Arabic Company, (SSGAC)	➢ Establish governance structures & guidelines for the sector ➢ Train communities on mgt of the resources, harvest and post-harvest handling			2019 - 2020

3.4 Profile of gums produced by different countries for quality assessment and control

3.4.1 Profile and physical description of gum samples

A total of thirty six (36) samples were sent to the NGARA Secretariat for analysis comprising four samples from Burkina Faso (B1 – B4), eight samples from Chad (C1-C8), four samples from Ethiopia (E1-E4), five samples from Kenya (K1-K5), two samples from Mali (M1-M2), four samples from Niger (N1 – N4), six samples from Nigeria (Ni1-Ni6) and three samples from Senegal (S1 – S3). Photos of representative samples are given in plates 3.1a – 3.1h. The physical characteristics are given in Table 3.3. All samples submitted were commercial gums and can be described as of varying colours, shapes and sizes. Almost all the samples had impurities of bark or sand. Different colours and presence of impurities affect the quality of gum hence the need for cleaning, sorting and grading, which is recommended to start at the level of collectors/producers, especially cleaning (Chikamai and Odera, 2002).

Table 3.3 provides an idea of the main types of gums of commerce being traded in the eight countries and Africa in general. *Senegalia senegal* gum appears to be the main source of commercial gum arabic collected and traded in the region. It is the main source of gum arabic (22 samples) in all the eight countries. *V. seyal* is the second most important source (6 samples) and was supplied from 6 countries. Niger has the resource and major supplier of the gum though it was not among samples supplied. Kenya also has the resource but has not commercialized it as in other countries. These results show that the two species produce commercial gum sold as gum arabic, which is also consistent with earlier studies (Chikamai et al, 1996a). *S. polycantha* (chad) and *S. laeta* (Nigeria) are normally traded and sold as gum arabic in some countries in Eastern Africa and West Africa respectively though they are not included in the official definition of gum arabic of commerce. Combretum gum was represented by two samples from Niger and Nigeria indicating that it is an important source of commercial gum. It is produced in most of the countries in the Sahel. One sample of Karaya gum from *Sterculia setigera* was supplied from Senegal. It is an important commercial gum with wide application in the food and pharmaceutical industries.

Plate 3.1a: Gum samples from Burkina Faso

Plate 3.1b: Gum samples from Chad

Plate 3.1c: Gum samples from Ethiopia

Plate 3.1d: Gum samples from Kenya

Plate 3.1e: Gum samples from Mali

Plate 3.1f: Gum samples from Niger

Plate 3.1g: Gum samples from Nigeria Plate 3.1h: Gum samples from Senegal

Table 3.3: Physical description of the gum samples

Country	Sample reference	Physical description of the sample
Burkina Faso	B1 - Hard gum	Pale yellow needle like shape mixed with spherical shape of varying size of up to 1cm diameter that breaks easily
	B2 - *Senagalia senagal* Hard gum	Spherical, amber , needle like shape that can easily break
	B3 - *Vachellia seyal* Friable gum	brown exudates mixed with varying light brown with minor impurities
Chad	*C1 – S. polycantha*	A well-formed round and dark brown to brown exudates.
	C2 – S. polycantha	A well-formed round and dark brown lumps of about 2.5 to 3cm diameter.
	C3 – *S. seyal*	A mixture of round brown and yellow lumps. Shape of varying size of up to 3cm diameter.
	C4 – S. senegal	Spherical lumps of between 1and 3cm diameter, amber in colour and hard to break. Minor impurities present
	C5 – S. senegal	Spherical lumps of between 1and 3cm diameter, brown in colour and hard to grind. Minor impurities present
	C6 – S. senegal	Spherical lumps of between 0.5and 3cm diameter, brown in colour and hard to grind. Minor impurities present
	C7 – S. senegal	Medium to large size brown exudates. Minor impurities noted.
Ethiopia	*E1 - S. Senegal* - Humera	A mixture of small and large exudates of up to 4cm diameter, brown colour.
	E2 - S. Senegal - Yabello	A mixture of medium and large exudates of up to 4.5 cm diameter, light brown to brown colour.
	E3 - V. seyal - Humera	A mixture of small, medium and large exudates of up to 3.5cm diameter, brown colour.
Kenya	K1 - Kaleng Turkana	Mixture of Pale yellow (spherical tears, varying sizes) and dark brown large sizes with impurities from bark

	K2 - Pelekech Turkana	Large exudates of dark brown colour with a lot of impurities of sand and bark. Samples appear over exposed to harsh weather conditions
	K3 - Kakelai Turkana	Mixture of dark brown and amber
	K4 - – Waso Ward Samburu	Amber colour with spherical shape that is hard to break and light brown, with a lot impurities from bark
	K5 - Sereolipi Samburu	Pale yellow mixed with amber and light brown. Bark impurities
	K6 - Laisamis Marsabit	Pale yellow and dark brown colour with some impurities
Mali	*V. seyal*	Small and large exudates of 0.5cm diameter with light brown colour.
	S. senegal	A mixture of small, medium and large exudates of up to 3.2 cm diameter, light brown to dark brown colour. Minor impurities noted
Niger	Ni1 - *Combretum nigricans*	Well formed round lumps with one brown colour. Diameter 1.5 to 2cm
	Ni2 - *Senagalia senagal*	Spherical, amber to pale yellow lumps , size powder to 0.5 cm
	Ni3 - *Senagalia senagal*	Large dark brown exudates. diameter of lumps, 0.2 to 1 cm.
	Ni4 - S. senegal var. senegal	A mixture of small to medium exudates of 0.5to 1cm diameter, light brown colour.
	Ni5 - Combrentum nigricans	A mixture of small and medium exudates of up to 1.2cm cm diameter, d brown to dark brown colour.
	Ni6 - S. laeta	A mixture of small, medium and large exudates of up to 3.5cm diameter, dark brown colour.
	Ni7 - V. variety *seyal*	Small needle like exudates of less than about 2 cm long and o.4 cm width.
Senegal	*S1 - V. seyal*	Small size exudates of 0.2 diameter, amber colour.
	S2 - S. senegal	A mixture of well formed medium and large size exudates of up to 3.0 cm diameter, brown colour.
	S3 - Sterculia setigera	Large exudates of up to 7 cm, light brown colour
Tanzania	T1 - *V. dreponalobium* Igunga District	Brown spherical shaped lumps ,large size with diameter range of 1-5cm
	T2 - *V. dreponalobium* Ikungi	Spherical, amber in colour, small to medium size of 0.5 to 3cm

	District	diameter.
	T3 - *V. dreponalobium* – Kishapu District	Large dark brown exudates mixed with varying light brown sizes.
	T4 - *V. dreponalobium* Iramba District	Brown spherical shaped lumps ,large size with diameter range of 1-5cm
	T5 - Commercial gum Igunga District	Spherical, amber in colour, small to medium size of 0.5 to 3cm diameter.

3.4.2 Physical and chemical characteristics of the gum samples

Results of the chemical analyses of the gums are presented in Table 3.4. The minimum quality parameters for commercial samples for quality control include moisture content (MC), ash content (AC), specific rotation, nitrogen (hence protein) and viscosity (FAO, 1999). Gum needs to be dried and stored at MC content below 15% because above that it attracts microbial activities responsible for decomposition. It also forms heavy gels, which can influence viscosity and affect further processing, especially if still fresh. All samples were within the desired range of MC. AC is used to determine the critical levels of foreign matter, acid insoluble matter, and salts of calcium, potassium and magnesium minerals, especially cations in the soil. All the samples were also within the limits except the sample of karaya gum, which had a value of 6%.

Specific rotation is an important parameter that measures the purity of the gum samples, whether there are adulterations i.e. mixing with gums from other sources. It is influenced by the nature of sugars in the gum. Commercial gum arabic is produced from *Senagalia senegal* or *Vachellia seyal* (FAO, 1999). *Senagalia senegal* has a negative specific rotation which ranges between -27° to -34°, nitrogen values between 0.27% - 0.63% and intrinsic viscosity values between 13 – 23 ml/g. *Vachellia seyal* on the other hand has a positive specific rotation ranging between 36° - 52°, generally lower nitrogen levels between 0.12 – 0.32 and lower intrinsic viscosity between 9 - 13 ml/g (Chikamai et al, 1996b). An examination of the samples submitted as *Senagalia senegal* reveal that they conform to the specifications for the gum from Senagalia Senegal. Two varieties of *S. senegal* from Nigeria gave characteristic results with var. kerensis showing higher values of optical rotation, nitrogen and viscosity (Chikamai and Banks, 1993). Sample of S. polycantha and S. laeta had low values for optical rotation and viscosity compared with *S. senegal* consistent with earlier studies (Chikamai et al, 1996). Overall however, the differences are comparable to those of *S. senegal* confirming the close relationship among the species that belong to the same vulgares series (sub-genus aculeiferum).

Analysis of gum of *Combretum nigricans* shows that it has a negative specific rotation between -45° and -47° but more optically negative compared with that from *Senagalia senegal* and thus confirming earlier studies.

Analysis of *S. setigera* gum shows that it has very high viscosity compared to all other gums and forms heavy gels. Earlier studies indicated viscosity values of 305° (Chikamai et al, 1996), an aspect that makes the gum suitable for applications requiring high viscosity.

Table 3.4: Proximate analyses of gum samples from selected countries

Parameter	Burkina Faso		Chad			Ethiopia		Kenya	Mali		Niger		Nigeria						Senegal			Limits FAO 1996
n	3 (Ss)	1 (Vs)	4 (Ss)	1 (Sp)	3 (Vs)	2 (Ss)	2 (Vs)	5 (Ss)	1 (Ss)	1 (Vs)	1 (Cn)	3 (Ss)	1 (Sss)	1 (Vs)	1 (Sl)	1 (Vs)	1 (Ssk)	1 (Cn)	1 (Ss)	1 (Vs)	1 (Sse)	
% MC	10.9	10.2	13.0	12.1	12.5	14.2	14.1	13.1	11.0	11.2	11.2	14.1	12.0	14.0	14.3	13.7	12.9	10.3	12.9	12.1	14.6	<15
% AC	3.7	2.8	2.8	3.0	2.6	2.8	2.9	3.1	3.0	1.9	2.6	3	4.3	2.2	3.7	2.0	3.3	2.6	2.5	2.9	6	<4.0
Spe. Rot.(deg)	-28	+16	-28	-13	+42	-30	+41	-33	-30	+52	-45	-30	-26	+48	-21	+55	-32	-47	-28	+50	+12	-27 to -34*
Gel	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+	+	+	+	+	+++	
pH	4.1	4.2	4.3	4.4	4.2	4.4	4.2	4.3	4.1	4.3	3.9	4.3	4.3	4.4	4.5	4.3	4.4	4.1	4.3	4.2	4.4	4.0 – 5.5
% N	0.29	0.35	0.29	0.25	0.17	0.30	0.15	0.33	0.30	0.18	0.33	0.34	0.34	0.17	0.38	0.17	0.34	0.25	0.34	0.16	0.11.	0.27% - 0.63%
Hence Protein	1.92	2.32	1.92	1.66	1.13	1.99	1.00	2.19	1.99	1.19	2.19	2.25	2.25	1.13	2.51	1.13	2.25	1.66	2.25	1.06	0.73	
Intr. viscosity	14.1	9.2	14.2	11.1	9.6	16.6	10.0	19.4	14.5	11.1	16.7	13.6	15.0	9.9	12	9.3	19.7	21.4	14	9.8	68	13-23*

Key: n – number of samples

*Range for gum arabic for *S. senegal*

Ss – *Senegalia senegal, Ssl – var. leiorachis, Ssk – var. kerensis, Vs – Vachelia seyal, Sp – Senagalia polyacantha, Cn – Combretum nigricans, Sse - Sterculia setigara*

Gel thickness: + - light; ++ - medium; +++ - heavy

3.5 Key stakeholders and their roles and price trends along the value chain and benefit sharing arrangements

The gum arabic sector comprises of two main types of stakeholders; actors along the value chain and those providing support to the sector.

3.5.1 **Actors along the value chain and their** roles in production and trade in gum arabic

Actors along the value chain fall in three categories; collectors, merchants (traders/wholesalers) and exporters/processors.

3.5.1.1 Collectors

Collectors and gum arabic collection (gum harvesting) constitute the first group/step in the value chain (Chikamai and Odera, 2002). Most of the gum produced in the nine study countries is from either natural exudation or injuries caused on trees by insect borers or animals (domestic or wild) and occasionally from stumps resulting from cutting of trees for making livestock enclosures or houses. In the traditional gum producing countries however, tapping is the main method of gum production (Elrayah et al, 2012; Semegnew et al, 2018). It has been observed that var. *kerensis*, which is the main source of gum arabic in Eastern Africa (Southern Ethiopia, Kenya and Tanzania) produces good quantities of gum through natural exudation though tapping has been shown to increase the amount (Wekesa et al, 2009). Generally, there is no organized tapping in Kenya and Southern Ethiopia. However, tapping is being practiced in the other countries which have var. *senegal* especially following awareness through various initiatives.

In Nigeria, Niger and Mali there are migrant/transhumant collectors who collect gum as they traverse the country through the Sahel in search of feed, fodder and water. Women and youth are usually the main players in gums and resin collection. The migrant collectors usually do not care about the species or varieties of gum arabic trees they collect gum from. They bulk the gum collected and sell to local traders regardless of species. These are herdsmen and their households without permanent residence or ownership of land. As soon as water, feed and fodder for their livestock is depleted in a particular location they move to another place which might be hundreds of kilometers away. Because of their migratory lifestyle it is difficult for them to form interest groups to be able to negotiate and take advantage of some offerings from government or NGOs.

In countries like Nigeria, gum collectors are farmers that cultivate gum arabic trees in their farms, plantations or shelter belts. They may be individual, private

or corporate organizations who live in the village or town. Cultivation of gum arabic is more in farms now because of insurgents. The individual farmers and corporate organizations cultivate gum arabic purposely for income. Harvesting of cultivated gum arabic is usually done by men and youth while women are mostly responsible for cleaning the gum at home. Producers of cultivated gum arabic in farms or plantations whether owned by private individual or corporate organizations are mostly male. Only on very rear occasions (1%) you find women cultivating gum arabic.

Most of the gum is collected by hand or if it is high up on the tree knocked off using a stick with a fork at one end. This limits the speed of collection owing to the thorny nature of the trees. However, Sudan has developed a special tapping tool called “sonke”, which is more efficient and is now being adopted in the other countries following awareness creation since 2004. Again, there are no specific containers for collecting in the field and storage at home though through general awareness over time collectors now use woven baskets from palm leaves and transfer into cloth, sisal or jute bags. Nevertheless, there is need to intensify awareness on suitable tools for harvesting and collection/storage of the gum to improve on the quality of gum collected. Virtually all the gum collected at this stage is in its natural state i.e. without cleaning and/or grading.

It is therefore recommended that an elaborate training programme be developed for enhancing capacities of collectors with special emphasis on suitable tools for harvesting i.e. tapping, collection and storage of the gum. The “Regional Training Manual” developed in 2005 has been reviewed and updated and will be used in the training. The training programme is attached as annex 4. Information regarding gender desegregation for collectors and other categories along the value chain is given in section 3.6 while that on benefit sharing is provided in section 3.7.

3.5.1.2 Merchants

Merchants constitute the second group in the value chain. They are essentially traders and wholesalers. Traders are of two types; village (sedentary) and agents (mobile). The former are based in village trading centers and purchase gums from collectors, which they bulk for sale to wholesalers or exporters. They buy gum either in cash or exchange for goods (barter). In some countries they are referred to as primary or retail traders. Agents are traders mostly hired by exporters and/or processors and move in gum production areas to buy gums either directly from collectors, village traders or from weekly markets where they exist. They are based in towns within the production areas though some stay in

major towns or cities. Depending on whom they are serving, some of the traders carry out cleaning, sorting and grading.

Wholesalers are based in major trading centers or towns in counties or regions of producer countries. This is the category where most of the cleaning, sorting and grading are carried out. Most of the wholesalers also pay for permits, levies and some of the related government taxes. Table 3.5 summarizes role of merchants in selected countries.

Table 3.5: Merchants and their roles in production and trade in gums and resins in selected countries

Country	Type of merchant	Roles
Burkina Faso	➢ Primary traders ➢ Main traders	➢ buy gum from collectors. Essentially are village traders. Purchase 39% of gum harvested ➢ buy 61% from collectors & 39% from primary traders; clean, sort & package; pay most of taxes/duties
Ethiopia/ Kenya/	➢ Village traders ➢ Agents ➢ Wholesalers	➢ buy gum from collectors at village centers (bulk). More sedentary ➢ are mobile traders who move from one village market to another within counties or states looking for gum arabic to buy. Normally sale to wholesalers, national merchants or processors ➢ buy from traders (most) and collectors (occasional); dry, clean and sort; package for local sale; pay permits/levies
Niger	➢ Active traders ➢ Passive traders ➢ Wholesalers	➢ buy gum from producers in villages, more mobile ➢ buy gum at weekly markets, they are mobile (from market to market to stock up) & sedentary (buy at weekly markets in producer zones) ➢
Nigeria	➢ migrant traders ➢ Village traders ➢ Agents ➢ Wholesalers	➢ transhumant collectors collect gum as they traverse the country through the Sahel in search of feed, fodder and water. Normally sale gum to village traders ➢ buy gum from collectors at village centers (bulk). More sedentary ➢ are mobile traders who move from one village market to another within counties or states looking for gum arabic to buy. Normally sale to wholesalers, national merchants or processors ➢ merchants that reside in urban centres or local government headquarters. They buy gum arabic from agents. They also receive gum directly from village traders. They in turn sell to exporters or processors.
Senegal	➢ Village traders ➢ Mobile traders ➢ Wholesalers	➢ buy gum from producers in villages and buy mostly in the form of barter (merchandise for gum) ➢ mobile traders acting mostly for wholesalers or exporters ➢ traders are mainly mandated by the Valdafrique Company with whom they sign an annual contract covering the gum marketing period. They can also act as agents for other operators (exporters) or resell their gum surpluses in local markets
Tanzania	➢ Traders ➢ Wholesalers	➢ buy gum from collectors at village centers ➢ buy from traders (most) and collectors (occasional); dry but minimal cleaning; pay most of taxes

More information on actions needed to streamline the value chain involving merchants is captured in section 3.7.

3.5.1.3 Exporters

Exporters form the last category in the value chain. Most of the gum arabic produced in the study countries is exported in the raw form. The numbers of exporters operating in the countries are few and some of them operate discreetly. **In Kenya** for example, this group that operates discreetly has declined to join the Gum Arabic and Resin Association (GARA), an umbrella organization supporting development of the sector. The major exporter of gum Arabic in Kenya is the Acacia EPZ based in Nairobi, which started operations in 2015 and has since exported 200 MT of gum Arabic to Germany with an ambitious programme of exporting 600 metric tonnes by 2020 (Chikamai, 2020). It is also active in the development of the gum Arabic sector in the country where it has partnered with GIZ on a project aimed at “Increasing Employment and Economic Opportunities for the communities in Kenya's ASAL Counties through Unlocking their Gum Arabic potential”. The other companies involved in gum Arabic trade at the national level include the African Agency for Arid Resources Ltd (AGAR), Arid Land Resources Limited (ALR) and Inter-Africa Investment Group Holdings Ltd but all have been supplying most of the gum to Acacia EPZ for lack of suitable overseas markets. The issue of markets is one area that needs to be explored. In Tanzania there are two exporters operating during the current study namely; Fidahussein Enterprise Limited and Middle East Grain Co. Ltd both based in Dar es Salaam (Makonda, 2020).

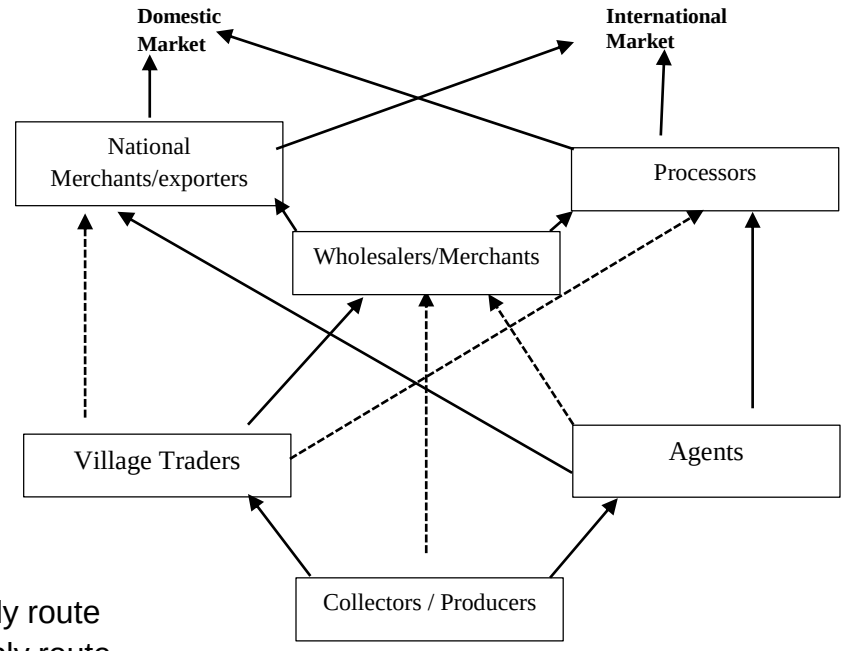
The situation in **Burkina Faso and Niger** is more or less the same where exporters are few in number. In **Burkina Faso** for example, the major exporter is Gomburki Company, a member of the Association of Professional Exporters of Gum Arabic (APEGA). Also in **Niger** there are now two main exporters; Achat International Service - Wonkoye in Niamey, which is the major internationally recognized exporter and Addax Group that has been exporting gum arabic for about 5 years now (Zerbo, 2020; Maisharou, 2020). Efforts to get the exact turnover of these exporters failed. They export huge quantity of gum arabic every year depending on the availability of the gum and the demand they get from their foreign partners. In 2018 per example, only 83 tons (of 425 tons produced in 2018) were exported from Niger with a declared monetary value of 33.1 million CFAF, (customs data cited by Maisharou Abdou, 2020). The SWOT Analysis of the gum arabic and resins actors is presented in another section. It worth mentioning that the exporters also employ 40 – 50 women for 6 months every year in the activities of sorting, cleaning of the gum before export.

3.5.1.4 Processors

As mentioned above, most of the gum arabic produced in producing countries is exported in the raw form, mostly as cleaned or in some countries like Sudan as cleaned and graded as per orders. Some countries like Sudan, Chad and Nigeria have also installed kibbling plants, which are able to process the gum nodules into smaller and uniform size particles for ease of dissolving during spray drying.

Processing into spray dried gum arabic is only carried out in the Sudan, Nigeria and Senegal. Currently in the Republic of Sudan there are 20 factories licensed to work in the production of granules and mechanical powder, of which 16 factories are currently operating, 14 of which produce granules and mechanical powder, and two factories for the production of spray dried powder. Dansa food processing in Kano is the only gum arabic processing company in Nigeria. It has an installed capacity of 15 tons of raw gum arabic/day. It processes gum arabic based on orders and specifications prescribed by the overseas receiving companies. In Senegal there is one company Valdafrique, which produces a large variety of gum products including Chewing-gum.

Figure 3.12 shows a generalized value chain flow chart



Key:

→ Main supply route

⇢ Minor supply route

Figure 3.12: Schematic value chain flow chart (Source: Chikamai, 2020)

3.5.2 Actors providing support to the sector

There are three categories of stakeholders supporting the sector; government (National & Regional/County), development partners and Non-Government Organizations (NGOs).

3.5.2.1 Government

National governments support the gum arabic sector by creating an enabling environment through formulation of various policies and laws (Acts as well as rules and regulations). The key actors and their roles by country are presented in Table 3.6.

Table 3.6: Government Agencies supporting the gums and resins sector and their roles

Country	Actors	Roles
Burkina Faso	Min Env, Green Eco & C. C (MEEVCC)	Formulation of policies/laws in forestry & NRs
	Regional and provincial directorates Local authorities	➢ implement policies/laws in forestry & NRs ➢ collect and process statistical data on gum arabic ➢ carry out inventory & assessment of tree stands ➢ mgt of forest resources
	National Forest Seed Centre (CNSF)	➢ development of seed and suitable germplasm
Chad	➢ Ministry in charge of Environment and Forestry ➢ Directorate of Forestry and the Fight Against Desertification. ➢ Ministry of Commerce through the National Investment Agency (ANIE) ➢ Chamber of Commerce, Industry, Agriculture, Mines and Handicrafts (CCIAMA) ➢ Chadian Association for the Promotion of Arabian Gum (ATPGA) ➢ Gum Arabic Exploitation Cooperative (IRBATH)	➢ Formulation of policies/laws in forestry & NRs ➢ Law enforcement – very active (through it various subdivisions in the field) in controlling deforestation of acacia stands ➢ ANIE promotes the gum arabic sector to international investors and export countries such as India. ➢ Promote the Chadian economy and participates in the promotion of Chadian gum arabic ➢ ATPGA: Established in 1999 by the AFD gum project. It brings together exporters and wholesalers in a wireless market. It provides advice on gum plantation management to associations and unions. ➢ IRBATH is an association of gum arabic wholesalers. It represents and protect the interests of the Wholesalers ➢
Ethiopia	➢ Environment, Forest and Climate Change Commission (EFCCC	➢ coordination of forest resources management in the country, including natural gum and resin resources
	➢ Ethiopian Environnent and Forestry Reseacrh Inst. (EEFRI)	➢ research on the production and marketing of gums and institutional aspects and present their findings to policy makers and planners
	➢ Environmental Protection and Land Administration Office	➢ regulates access to forest land by issuing permits for forest concessions
	➢ Ethiopian Customs Authority	➢ issues export permits though documentation hardly distinguishes between various gums and resins
Kenya	➢ Min of Env and Forestry	➢ Formulation of policies/laws in forestry & NRs
	➢ Kenya Forest Service (KFS)	➢ conservation and management of forestry including development of enterprises including gums and resins
	➢ Kenya Forestry Research Institute (KEFRI)	➢ R&D in forestry including development of gums and resins

	➢ Kenya Plant Health Inspectorate Service (KEPHIS)	➢ Issuance of phyto-sanitary certificates for food grade gum Arabic
	➢ Export Promotion Counsel (EPC)	➢ Documention of export & import data of commodities including gum & resins
	➢ County governments	➢ Develop & implement County Integrated Development Plans (CIDPs) some that include
Mali	➢ The Ministry of the Environment, Sanitation and Sustainable Development	➢ Management of forestry resources its National Directorate of Water and Forests and its branches at regional and local level for the issuance of permits for the exploitation of NTFPs including gum arabic
	➢ Ministry of Agriculture	➢ Quality control of the produce including gum arabic
	➢ The Ministry for the Promotion of Investments. (MPI-Mali)	➢ Promotion of investment activities in the total or partial processing of gum arabic ➢ Promote the export of many commodities from Mali,
	➢ Agency for the Promotion of Export (APEX)	➢ Promote the export of gums and resins in Mali through the project for strengthen the productive and commercial capacities of the gum arabic sector
Niger	➢ Ministry of Environment	➢ Formulation of policies/laws in forestry & NRs
	➢ Directorate of Green Economy	➢ implement policies/laws in forestry & NRs ➢ Management of Forest resources
	➢ Natonal Agency of the Great Green Wall Initiative	➢ Degraded land rehabilitation and tree planting for improving the production potential ➢ Capacity building through training and organization of local communities in various gum producing areas
Nigeria	➢ Federal Ministry of Agriculture and Rural Development (FMARD)	➢ Formulation of policies/laws in forestry & NRs
	➢ Rubber Research Institute of Nigeria	➢ Implement policies/laws in R&D as well as capacity building in forestry including development of gum arabic
	➢ National Agency for Food Drug Administration and Control (NAFDAC)	➢ Regulation and control of the importation, exportation, manufacture, advertisement, distribution, sale and use of drugs, cosmetics, medical devices, packaged water and chemicals in Nigeria. Gum arabic as a food additive is regulated by NAFDAC under food
	➢ National Agency for the Great Green Wall (NAGGW)	➢ Establishment of a green wall or shelterbelt from Kebbi state in North west to Borno state in North east a distance 1,500km and 15km across ➢ Promotion of alternative means of livelihoods
Senegal	➢ The National Agency of the Great Green Wall	➢ Implement of the Great Green Wall in Senegal through land reclamation and planting gum producing trees for improving the production potential
	➢ Program for Building Resilience to Food and Nutrition Insecurity in the Sahel	➢ Development of forest value chains through the protection and management of natural resources in the project's intervention zone, namely Fatick, Kédougou, Kolda, Matam, Tambacounda and Ziguinchor for a period of five (05) years (2015-2019)
	➢ The Senegalese Institute of	➢ Development of forestry research actions in order to develop large-scale joint

	Agricultural Research	projects and programs to strengthen the resilience of populations and ecosystems
South Sudan	➢ Ministry of Environment and Forestry	➢ Formulation of policies/laws in forestry & NRs
	➢ Ministry of Trade	➢ Development of the gum arabic sector through establishment of South Sudan Gum Arabic Company, (SSGAC)
	➢ Green Horizon Company	➢ Capacity building through training of local communities in various gum producing areas

3.5.2.2 Development partners

Various development partners have been involved in the development of the gums and resins sector in the countries by providing technical and financial support.

Burkina Faso - Export Promotion Agency of Burkina Faso (APEX), Economic Growth Programme in the Agricultural Sector (PCESA), Coris Bank International, Ecobank and Credit Unions are some of the partners supporting the gum Arabic sector. For example, in order to facilitate access to credit, PCESA has set up a guarantee fund at the level of two banks, Coris Bank International and Ecobank. However, access to credit for actors in the sector remains blocked to date due to problems of implementation modalities. In addition, PCESA offers another financing opportunity at the level of plantations and reforestation of gum trees. This is through establishment of the Green Fund amounting to US$ 3.5 million. This fund should make it possible to pursue the policy of planting and renewal of stands, research for better species of *Senegalia senegal* etc.

Among the international development partners that have supported or are still supporting the sector technically and/or financially are FAO, the European Union, the Italian Cooperation, CIFOR, Interstate Committee for Drought Control in the Sahel (CILSS) and Association for the Promotion of Education and Training Abroad (APEFE). Details of each are given in the table below.

Table 3.7: Roles of development partners in Burkina Faso

MEEVCC	• To support the State in strengthening the capacity of its decentralized technical structures in order to: - Collect and process statistical data on gum arabic in order to make them available to users. - identify, characterize and measure the surface area of gum tree stands - Assess the condition of the stands and the available infrastructure ; - Select or introduce through the CNSF, the best species of S. senegal
PCESA	set up a guarantee fund at the level of two banks, CORIS BANK INTERNATIONAL and ECOBANK. to set up a Green Fund of 2 billion FCFA in order to pursue the policy of planting and renewal of stands, the search for better species of S. senegal
FAO, UE, CILSS, Coopération Italienne, CIFOR	Technical and financial support to the gum arabic sector

Chad – The National Investment Agency promotes the Chadian gum arabic to international investors for exporters. The Chadian Association for the Promotion of Arabian Gum (ATPGA) which was established in 1999 by the AFD gum project. This association brings together exporters and wholesalers in market. It provides advice on gum plantation management to associations and unions. French Development Agency (AFD), the European Union support a project of € 4.5 million in fighting against desertification, poverty and food insecurity. Another project is, the gum arabic trade capacity building project; supported by the Government of Chad through the Special Trust Fund, the UNDP, and gum arabic stakeholders. The awaited results of the projects are : (i) the socio-economic characteristics of the gum arabic sector are better known, (ii) the gum arabic sector is better structured and the production is increased, (iii) the quality of the gum arabic produced is improved, (iv) the gum is exploited in a rational and sustainable basis and the producers master the techniques of production and sustainable exploitation, (v) the field producers are better organized and play an active role in the development of the gum arabic sector, (vi) the distribution channels are better structured and organized, and (vii) the products put on the market are better valued, competitive and ingenious.

Among the national and international NGO engaged in the gum arabic sector, include: French Association of Volunteers for Progress (AFVP), national NGOs such as: NAFIR, ACCORD, AICF, SECADEV. There all active in supporting producers and producers' associations in the production of better quality and reasonable quantities of gum Talha and Hassab in the country.

Kenya - Various development partners have been involved in the development of the gums and resins sector in the country since the 1990s. However, at the time of this study, the following were identified as active; Government of Germany through GIZ, Government of Sweden through Sida, Government of Switzerland through SDC and the Food and Agriculture organization of the United Nations (FAO). GIZ has recently entered into a partnership agreement with the Acacia EPZ Limited, a private company dealing in the export of Gum Arabic to Europe (Chikamai, 2020). This is being achieved through a project aimed at "Increasing Employment and Economic Opportunities for the communities in Kenya's ASAL Counties Unlocking their Gum Arabic potential". The project is essentially building capacity of the main actors in the value chain and relevant actors supporting the sector in collection practices, grading, quality control and value addition techniques. Sida is supporting a project "Integrated Management of Natural Resources for Resilience in the ASALs (IMARA)" covering Isiolo, Samburu, Marsabit and Laikipia Counties that aims to transform lives of households, revitalize and preserve rangeland assets for the benefit of future

generations. One of the activities is to streamline the operations of the gums and resins sector through development of the value chains and access to markets.

Government of Switzerland through the Swiss Agency for International Development Cooperation (SDC) has funded a project “African Forests, People and Climate Change” Programme that is being implemented by the African Forest Forum (AFF) with an amount of USD 256,000 for the period 2019 - 2021. Through the above programme, AFF has in turn commissioned a study on “Strengthening Capacity among Stakeholders for Production and Trade in Gums and Resins in Africa” in four African countries including Kenya and contracted the Network for Natural Gums and Resins in Africa (NGARA) as the lead executing agency. The aim is to build capacities and skills of stakeholders to address adverse effects of climate change and take up opportunities that come with climate change through better management and use of Africa's forests and tree resources in various landscapes. In Kenya the studies are being implemented in Turkana, Marsabit, Isiolo and Wajir. FAO is implementing the “Restoration of Arid and Semi-Arid Lands (ASALs) of Kenya through Bio-enterprise Development” project, which is one of 11 Child projects under The Restoration Initiative (TRI) funded by the Global Environment Facility (GEF) with an amount of USD 4,157,340 August 2018-July 2023. The project’s overall objective is to restore deforested and degraded lands through the Forest Landscape Restoration (FLR) approach and enhance the socioeconomic development of local communities through the development of bio-enterprises of Non-Timber Forest Products and Services (NTFPs) in ASALs including gums and resins. It is being implemented in Marsabit, Samburu and Laikipia Counties in Kenya.

The development partners in **Mali** include: (i) the united nations for the implement of the “project for strengthen the productive and commercial capacities of the gum arabic sector in Mali"; (ii) the USAID for the funding and implementation of project on Accelerated Economic Growth Program; (iii). The European Union (EU) for funding Global Alliance Climate Change Program in Mali. All these projects and program have largely contributed for the sustainable management and increase the potential of gum arabic production in Mali and also the income of local people.

In **Niger,** the development partners include the National Government through the implementation of Gum arabic project for the restoration of degraded land and afforestation of some high productive gum arabic species. Others include: (i) the World Bank through the implementation of PAC3 project for the sustainable land management of over 80 000 hectares for restoration; (ii). The European Union, FAO and UNCCD, for funding the Action Against Desertification and the FLEUVE

project, both for sustainable land management in the regions of Tahoua, Tillaberi, and Dosso, (iii) the IFAD through support in the sustainable management and land restoration of the fragile agro-sylvo-pastoral ecosystems affected by desertification, land degradation and drought in many municipalities in Niger.

In **Nigeria** the International Fund for Agricultural Development (IFAD) has supported uptake of grade one gum arabic seedlings for the establishment of community based gum arabic plantation for many years in Nigeria.

3.5.2.3 Non-Governmental Organizations

There are a number of NGOs in member countries that are active in supporting the gums and resins sector. In **Burkina Faso** for example the Association of Volunteers for Development in the Sahel is active. The NGO actively engaged in the gum arabic sector in Chad include: the French Association of Volunteers for Progress (AFVP), national NGOs such as: NAFIR, ACCORD, AICF, SECADEV. They all support gum arabic actors in the field of training, capacity building in order to produce better and quantity and high quality of gum arabic from *Vachelia seyal* (Talha) and from senegalia senegal (Hassab) in the country. In **Kenya** Mercy Corps based in Turkana County is building capacity of the local community in Turkana North Sub County and linking them to markets. World Vision Kenya (WVK) based in Marsabit County is implementing the IMARA project, which is building the capacity of collectors and local traders in aspects of quality production of gums and resins as well as strengthening the capacity of Laisamis Gums and Resins Co-operative Society Ltd in terms of organization and management aspects.

In **Mali**, active local NGOs include Damier in Kayes active for financing gum tree plantations; the ADAF/GALLE (Association for the Development of Production and Training Activities) is active for strengthening the production capacities of gum arabic producer, mainly women, through training on the good practice on the bleeding technique and support for the planting of *S. senegal* in the commune of Gomitradougou, Cercle de Diéma, Region by Kayes. About 100 ha of gum trees have been planted in the Sahel, Karakoro and Djelibou communes. However, the insecurity that has prevailed for a number of years has discouraged NGO activities in the gum arabic sector. Others include OMAFES (Malian Work of Aid to Women and Children in the Sahel) that works for maintaining the commitment to relaunch the sector in Mali; ICRAF (International Center for Agroforestry), and DEGUESSI VERT for respectively the quality of planting materials and plantations establishment of gum arabic species in Mali. Déguèssi Vert in Nara has planted about 1000ha of gum trees.The exporters enterprises

include SOMIVAP-SA, SODEPAM-SA, GCPS/GENERAL COMMERCE DES PRODUITS SAHELIENS-SARL, and SIPROPAM, etc. lead by Mali nationalities.

In **Niger,** the major Non-Governmental Organization very active in strengthening the production capacity of gum arabic include S.O.S International-Niger and CNCOD-a very large grouping of local NGOs supporting the rehabilitation of land degradation through *S. senegal* and *Vachelia seyal* planting and the strengthening the institutional capacity of local producers, Achat service International and ADDAX Group involve in the *S. senegal* planting and export of gum arabic and resins, and the National Association of Gum arabic exporters (NAGA) involved in the strengthening the capacities and defense of the of local producers' right.

In **Nigeria** Dansa Foods Processing Company, is the only company processing gum arabic in Nigeria. The company can process about 10 - 15 tons of gum arabic per day producing a wide range of spray dried gum arabic named after different gum arabic species. However, the major player in the gum arabic sector is the National Association of Gum Arabic Producers, Processors and Exporters Association of Nigeria (NAGAPPEN), a private sectors gum arabic commodity value chain association with local chapters of the association in 12 gum arabic producing states of North West and North Eastern Nigeria.

3.6 Actors desegregated by gender in production and trade in gum arabic

Principal players in gum collection in most producer countries are women who normally collect it on individual basis or in groups. In Eastern Africa (e.g. Kenya and Tanzania) more than 75% of the collectors are women with a smaller proportion (55%) involved in Southern Ethiopia though men (93%) are major players in North Western Ethiopia. A similar observation was observed in Nigeria where women and youth dominate in gum collection, especially among the migrant collectors, who until the insecurity posed by Boko Haram constituted 2/3 of the collectors in the production areas. In West Africa (e.g. Burkina and Niger) women constitute about 46% with more men from the poor background becoming involved. However, the situation in Senegal seems different where gum collection is coordinated by men as heads of households who make up 70% of the collectors though women and children remain key players in the collection of gums. Elsewhere, youth (boys) also participate in gum collection while looking after small stock (shoats) and calves near homesteads or assisting their mothers (girls) in fetching water or fuel wood. Various studies have shown that women and youth are main players in gum arabic collection (Wekesa et al, 2013). In some areas men also participate in gum collection while herding with some from poorer background taking up gum collection as a livelihood strategy. Women and

youth are therefore an important group to consider when developing programs for enhancing gum production in Eastern Africa while the vulnerable groups in West Africa should be considered. The studies revealed that collectors have the lowest level of education (no formal or primary school), financial status and limited understanding about existing national policies and/or regulations. Similar studies on gum arabic and related NTFPs confirm the same (Yazbeck, 2015). Therefore, programmes need to be tailored taking into account the status of this group.

Cleaning, sorting and grading are main activities undertaking by merchants besides bulking for sale (local or export). They therefore employ staff, a majority of whom are women and girls. However, majority of the merchants, especially wholesalers are men.

Exporters and processors are men in most of the countries. The main activities undertaken include final cleaning, sorting and grading and packaging where women are a majority of the staff employed.

3.7 Value chain analysis and benefit sharing in the study countries

The various activities carried out at each node of the value chain were discussed in section 3.5. In this section, an analysis is provided of the cost of activities including the purchase and sell prices at each node from which a profit margin is calculated to understand benefit sharing arrangements along the value chain. Table 3.8 summarizes the activities and costs for gum arabic in the four representative countries.

The main activities undertaken by collectors to which a cost element was attached are collection and transport. To attach a cost value on collection, opportunity cost was computed. This took into account the minimum wage for Agricultural Services paid in each country, average production for collection of gums or resins per day and time used in gum/resin collecting activities, which was considered as one-half in relation to other chores by the collector as indicated in Table 2.5. Results showed that there was variation in the costs incurred by collectors in different countries though they generally obtain a good return on their investment with profit margins ranging between 46% in Tanzania to 55% in Niger. This is the first time that calculation of profit margins has been computed for collectors since previous studies did not assign a cost or opportunity cost for gum/resin collection (Chikamai and Odera, 2002; Chemuku et al, 2013).Village traders were encountered in East Africa and Burkina Faso. Costs also varied with those in Burkina Faso and Kenya carrying out more activities of cleaning and storage. The profits received were modest varying

between 13% in Tanzania and 25% in Burkina Faso. Agents were encountered in Kenya and Niger where profits varied between 9% and 29% in Niger and Kenya respectively. Agents had better margins than traders in Kenya. Earlier studies showed that village traders and/or agents earned profit margins of about 7% for gum arabic (Chikamai and Odera, 2002; Chemuku et al, 2013) indicating that the margins have improved over time. Wholesalers are present in all the countries and seem to be the ones who carry out most of the post-harvest handling activities in addition to paying various government taxes. The increased role, especially in cleaning is a more recent phenomenon to add value and get better prices but in the process they incur post-harvest losses through removal of foreign matter and loss on drying during stotage. Taxes (cess and movement permits) are government requirements but costs to wholesalers. Compared to other actors along the value chain, profit margins for whole salers were the least and ranged from -7% in Tanzania to 15% in Niger. Profit margins for wholesalers are still comparable to earlier studies, which reported figures of about 18% (Chikamai and Odera, 2002). However, Tanzania is affected most by heavy government taxes, which eat into the profits to the extent that they make losses in real terms. The government needs to address, if the gum arabic or NTFPs sector is to become profitable and contribute to SFM. Meanwhile, exporters also carry out several post-harvest handling activities including payment of various government taxes. Profit margins varied across the countries with Niger having a modest margin of 6% and Tanzania the highest margin of 94%. Previous studies showed genrally good return on investment by exporters with profits margins of about 50% (Chikamai and Odera, 2002).

Table 3.8: Activities, costs and income in dollars at different nodes for gum arabic in the four representative countries

Actor/Node	Activity (costs in US$/kg)	Burkina Faso	Kenya	Niger	Tanzania
Collector/ Producer	❖ Opportunity cost	0.35	0.55	0.55	0.104
	❖ Transport	0.04	0.02	0.04	NA
	❖ Cleaning	NA	NA	0.2	NA
	❖ Food/water	0.05	0.05	0.06	NA
	❖ Packaging	0.01	0.01	0.01	NA
	❖ **Total costs**	**0.45**	**0.63**	**0.86**	**0.104**
	❖ Sell price	0.68	0.90	1.336	0.152
Village trader	❖ Purchase price	0.68	0.90	NA	0.152
	❖ Transport	0.04	0.02		0.02
	❖ Cleaning	0.02	0.02		NA
	❖ Packaging	0.03	0.05		NA
	❖ Post harvest losses	0.03	0.01		NA
	❖ Taxes (permits, gvt taxes)	NA	NA		**0.172**
	❖ **Total costs**	**0.8**	**1.00**		0.195
	❖ Sell price	1.00	1.20		
Agent	❖ Purchase price	NA	0.90	1.336	NA
	❖ Transport		0.02	0.04	
	❖ Cleaning		0.02	0.02	
	❖ Post harvest losses		0.02	0.06	
	❖ Packaging		0.05	0.03	
	❖ **Total costs**		**1.01**	**1.486**	
	❖ Sell price		1.30	1.618	
Wholesaler/ Merchant	❖ Purchase price	1.00	1.20	1.618	0.195
	❖ Transport	0.04	0.02	0.04	0.043
	❖ Cleaning	0.04	0.02	0.04	NA
	❖ Storage	0.03	0.02	0.03	0.004
	❖ Post harvest losses	0.02	0.03	0.02	0.004
	❖ Taxes (permits, gvt. Taxes)	0.02	0.25	0.02	0.381
	❖ Packaging	0.02	0.05	0.02	**0.627**
	❖ **Total costs**	**1.17**	**1.59**	**1.788**	0.586
	❖ Sell price	1.34	1.80	2.062	
Exporter	❖ Purchase price	1.34	1.80	2.062	0.586
	❖ Transport	0.06	0.04	0.06	1.0
	❖ Cleaning	0.02	0.02	0.06	0.004
	❖ Storage	0.02	0.02	0.02	0.004

	❖ Post harvest losses ❖ Taxes (permits, gvt. Taxes) ❖ Packaging ❖ **Total costs** ❖ Sell price	0.02 0.04 0.10 **1.60** 1.80	0.03 0.25 0.10 **2.26** 3.00	0.02 0.04 0.10 **2.362** 2.498	0.004 0.204 **1.802** 3.500
Profit margins	❖ Collector ❖ Village trader ❖ Agent ❖ Whole saler ❖ Exporter	0.23 0.20 NA 0.17 0.20	0.27 0.2 0.29 0.21 0.74	0.476 NA 0.132 0.274 0.136	0.048 0.023 NE -0.041 1.698
% profit	❖ Collector ❖ Village trader ❖ Agent ❖ Wholesaler ❖ Exporter	51.111 25.00 NA 14.530 12.50	42.857 20.000 28.713 13.208 32.743	55.349 NA 8.883 15.324 6.071	46.154 13.372 NA -6.539 94.229

Determination of opportunity cost for collector/producer in collecting 1 kg gum is based on the following assumptions:

- The minimum wage for Agricultural Services e.g. for Tanzania is USD 1.669 day^{-1}
- Average gum production is 8 kg day^{-1}
- Only one-half of the time is used in gum collecting activities
- The production unit (opportunity) cost therefore, is determined as Daily Wage/Daily Production

USD 1.669/x1/2x1/8 kg = USD 0.104 kg^{-1}

3.8 Existing capacity in the gum Arabic sector in terms of value addition and markets

3.8.1 Synthesis of value addition technologies and storage systems in production and trade of gum arabic

Generally, value addition technologies comprise primary (harvest and post-harvest) and secondary (processing). Primary technologies entail collection, drying, cleaning, sorting, grading and packaging while processing depends on the commodity i.e. whether gums or gum resins. For gum arabic and plant gums in general processing covers kibbling and/or spray drying while for gum resins it covers distillation or solvent extraction.

Best practices for harvesting of gum arabic have been established in the Sudan where gum arabic is tapped. A specially designed tool called “sonke” has been developed for tapping (Elrayah et al, 2018) which is used to make incisions in the branches or stems of trees and bark stripped off to cause gum to ooze. The sonke is also used for knocking off gum from the trees. First collection is made after 4-6 weeks and thereafter every two weeks until end of the season. For gum resins Ethiopia has developed a special tool called “mingaf” (Wubalem et al, 2002) which removes a thin layer of bark (2mm deep and 4-8mm wide) and also for knocking off the gum resin during collection. Cleaning the wound is done after every seven days and first collection made after three weeks after which the wound widened gradually and the process continued until the onset of the rains. Tapping indeed improves the quantity and also quality of the gum produced. However, naturally exudate gum/gum resin or that due to injury is still collected. Most gum from *V. seyal* and *S. senegal* var *kerensis* are through exudation or injury. The above equipments need to be developed for use in the member countries.

Proper post-harvest handling practices also require that collected gum by merchants is brought into stores and temporarily stored in cloth, sisal or jute bags where the gum is transferred and then taken to drying shades, which are installed with tables of wire mesh. The latter are important to ensure that gum dries to required moisture content. During drying, cleaning is carried out to remove bark and any other observed foreign material e.g. leaves, soil, insects etc. This is followed by sorting to separate clear/amber lumps (good quality nodules) from dark brown or those containing lots of foreign material. At the same time sieving is done when gum is upturned on a wire mesh over a table to separate small pieces and dust from larger nodules. Most merchants post-harvest handling activities up to this level where gum is regarded as cleaned. However, it was noted that such elaborate facilities were not existing or insufficient in member countries. Gum is then graded. Sudan has a more elaborate grading of gum arabic into five grades (Hand Picked Selected,

Cleaned, siftings, dust and red) depending on the orders (FAO, 1996). In Kenya, there are three major grades; cleaned clear/amber nodules (Grade 1), darker coloured nodules (Grade 2) and siftings/dust (Grade 3). Niger has also three grades depending on purity and size of nodules; large nodules free from impurities (grade 1), medium size nodules (grade 2) and minute nodules to dust (grade 3). It is sold as cleaned in the other countries. The status of processing has been presented in section 3.5.1.4 under processors

Country	Strengths	Weaknesses	Opportunities	Threats
Burkina Faso	❖ Existence of high production potential ❖ High demand for the product on international market, ❖ Source of income & availability of production actors & exporters ❖ Existence of local and umbrella organizations & local market	❖ Resource degradation ❖ Poor quantity and quality of the gum produced & lack of knowledge of GA quality criteria and standards ❖ Weak organizational and technical capacities ❖ Insufficient financial support and supervision ❖ Lack of knowledge of producers in production, harvesting techniques & equipment ❖ Weak road infrastructure & poor means of transport ❖ Lack of storage and sales counter infrastructures	❖ Existence of projects and programmes promoting the establishment of pure plantations of *S. senegal*, ❖ Existence of trained manpower in production and harvesting techniques, ❖ Existence of financial support from various donors ❖ Existence of buyers & unsatisfied world market demand	❖ Price fluctuation for raw gum arabic ❖ Lack of financial resources: not enough liquidity to be able to store large quantities and thus increase profit; ❖ Difficulties of producers to access to credit, ❖ Poor market control / export prices; ❖ Insecurity

3.8.2 SWOT analysis related to value addition and markets of gum arabic

Chad	❖ Existence of a high production potential (perhaps the highest among the countries involved); ❖ Strong demand for the gum on the international market; ❖ Existence of local organizations; ❖ Research structures on the development of the rubber sector almost non-existent	❖ Weak national policies and strategies related to the gum arabic sector in Chad ❖ The umbrella organization is not interested in producer-gatherers; ❖ Continuous degradation of gum resources; ❖ Lack of infrastructure in areas of high production especially Talha gum l; ❖ Very few policies and private initiatives for the development of the sector; ❖ No directorate dedicated to gum arabic and other NTFP; ❖ Lack of appropriate financing for the development of the value chain;	❖ The availability of producer-gatherers (women and young people); ❖ The possibility of transformation of the gum; ❖ Several types of species producing gums are available and even requested; ❖ Strong demand for gum by new emerging countries; ❖ The creation and operationalization of the NAGGW Initiative-	❖ The selling prices of gum abroad are not known to all the players/actors; ❖ Producer price very low and very attractive to the producers/collectors; ❖ Lack of store to secure the stock of unsold eraser

Ethiopia	❖ huge resource base that is currently underutilized; huge domestic and international markets; good enabling environment – policy & public institutions	❖ lack of clear access rights and ownership as well as community involvement, lack of proper market information system and poorly organized value chain, poor harvesting and post-harvest handling practices, weak enforcement of existing policies/laws coupled with lack of proper institutional arrangements for the sector	❖ availability of cheap labor force in the country for developing the production sector, exemptions from import duties applied for Ethiopia in the US and EU markets (for inputs), introduction of improved policy reforms and appreciation of the contribution of the commodity to rural livelihoods and the national economy as well as presence of regional and international institutions towards the development of the resources ❖	❖ Land use conflicts through largescale agricultural expansion and overgrazing, frequent drought and climate change, conflicting policies, programs and strategies at different sectors

Kenya	❖ huge resource base that is currently underutilized; huge domestic and international markets; good enabling environment – policy & public ❖ Existence of established institutions for R&D, GARA and Export promotion institutions like Brand Kenya and Export Promotion Center as well as NGARA for development of the sector	❖ poorly organized value chain and weak enforcement of existing policies/laws	❖ Development of niche markets for Kenya n gum arabic with high viscosity	❖ Frequent droughts and floods arising from climate change and insecurity in the gum production areas
Mali	❖ Existence of gum-producing potential in terms of natural formations and private plantations; ❖ Existence of a legal framework (legislative and regulatory texts) for the management of forest resources in general and gum trees in particular. ❖ Existence of national policies and strategies related to the gum arabic sector in Mali ❖ Existence of local manpower trained for producing gum arabic;	❖ Continuous degradation of natural gum trees and a downward trend in the production of gum arabic due to uncontrolled exploitation (pastoral and agricultural activities, bush fires, etc.); ❖ Lack of control over the spatial distribution and condition of natural gum tree formations; ❖ Low producer purchase price due to the lack of campaign start-up funds from producers; ❖ Insufficient political and	❖ Existence of high potential for the production of gum arabic and resins in Mali, ❖ Strong demand for gum arabic from Mali ❖ Existence of several countries requesting gum arabic and resins from Mali	❖ Decreased rainfall, ❖ Insecurity in gum arabic production areas, ❖ Political instability of the country

	❖ Existence of a strong demand on the international market; ❖ Existence of two pre-treatment units in Kati and Sandaré for the creation of added value ❖ Existence of a relevant institutional framework at the country level with appropriate multisectoral coordination; ❖ Existence of project and private initiatives working in the development of the gums and resins sector:.	institutional support for raising awareness of information		
Niger	❖ Existence of important potential that needs only valorization ❖ Existence of National Directorate in charge of the promotion of non-timber forest products, ❖ Existence of a National Association of Gum Arabic Producers and Exporters (ANGA) currently chaired by the Chairman and CEO of the ADDAX group ❖ Existence of vast degraded land suitable for the plantation of gum arabic species	❖ Lack of improved varieties, ❖ Low productivity of the varieties available, ❖ Insufficient protection of plantations ❖ Insufficient resources to build the capacities of actors ❖ Insufficient structuring of actors ❖ Insufficient botanical identification during seed collection, Knowledge of the behavior of the species), ❖ Absence of an organization grouping together small farmers in the sector ❖ Frequent of bush fires	❖ Gum arabic sector is governed by a law 2004-040 relating to the forest code, but lacks a specific framework organizing the exploitation and marketing of gum arabic and resins, ❖ National strategy to revive production and marketing with the main principle of "making gum arabic adopted in 2003 ❖ National strategy adopted in 2017 for the promotion of non-timber forest products, of which 16 products including gum arabic with flagship species for each region ❖ Guiding principle governing the development of these two (2) strategies is to provide quality products for internal consumption and for exports based on the principles of the Food Codex.	❖ Aggressive bleeding techniques which promotes the degeneration of gum trees; ❖ Competition with agricultural (clearing) and pastoral activities (bush fires, overgrazing, cutting fodder, etc.); ❖ Land clearing linked to the increased use of wood, (iv) the overexploitation of certain easily accessible areas; ❖ Inaccessibility of areas with high gum potential due to a lack of road infrastructure; ❖ Lack of water points and the insecurity currently plaguing certain production areas.

Nigeria	❖ Huge resource base that is currently underutilized with a huge domestic and international markets ❖ A strong institution in R&D in gum arabic that has resulted in improved germplasm for increased yield and quality as well as general development of the gum arabic sector ❖ A model gum arabic processing plant with installed capacity of 15 tons of gum arabic/day ❖ A strong team of qualified human resource	❖ inadequate funding for the gum arabic sector ❖ Low quality gum arabic due to adulteration ❖ Poor coordination and communication among key stakeholders	❖ Gum trees are suitable for rehabilitation and restoration of degraded lands programmes ❖ Attractive prices in the local and international markets as well as new markets and niches for different types of gums ❖ Favourable policies for production and marketing of gum arabic in Nigeria	❖ Insurgents ('Boko Haram') attack in North Eastern Nigeria, cattle rustling, armed banditry and kidnapping in North Western gum arabic producing states have posed serious threats to the growth and development of gum arabic industry in Nigeria ❖ Climate variability and climate in the form of desertification, frequent droughts, high temperatures are major threats to the industry
Senegal	❖ Existence of natural stands of *S. senegal, V. seyal*, Commiphora africana, and Sterculia setigera ❖ Existence of agro pastoralists with a long tradition of gum exploitation	❖ Lack of organization of the sector ❖ Poor Pricing	❖ Reforestation by the private sector ❖ Creation of the Senegalese Agency for Reforestation and the Great Green Wall ❖ Existence of national and international markets	❖ Decrease in rainfall ❖ Poverty in local communities ❖ Mortality of natural stands ❖ Lack of community initiatives to promote the gum sector ❖ Pruning for fodder feed for livestock, especially small ruminants (sheep, goats)
South Sudan	❖ Big areas of gum-producing potential in terms of natural formations ❖ Existing Forest Policy for the management of forest resources in general ❖ Development partners like SNV for training local communities on gum Arabic post-harvest	❖ Degradation of natural gum trees in the production of gum Arabic areas due to higher demand for the charcoal and higher demand for pastoral and agricultural activities, wild fires for collecting wild honey, bush meat, etc.); ❖ Limited information about	❖ South Sudan has huge potential for the production of gum Arabic and resins. ❖ Most of gum producers in gum producing areas are trained in post-harvest handling. ❖ Establishment of the Inter ministerial Task Force for Gum Arabic in 2010 ❖ South Sudan neighbouring	❖ Insecurity in gum Arabic production areas ❖ Lack of relative peace and poor implementation of peace agreement signed in 2015. ❖ Lack of political will and poor institutional capacity for raising

	❖ Higher demand for the gum Arabic in the international market;	the exact areas under gum Arabic. ❖ No fixed price and producers get low price due to poor market information	countries have higher demand for gum Arabic ❖ Establishment of gum Arabic certificate of origin and Phytosanitary certificate	awareness on economic benefit of gum Arabic to the local producers.

3.9 Updated report on trade and market analysis (Business perspective)

Presented as a separate report

3.10 Review of existing national policies, laws and frameworks relevant to the Arabic gum production, management, restoration, and development, processing and trade of gum Arabic in the countries

Policies and regulations have a big influence in providing an enabling environment to the development of any sector in a country. However, this is an area which has not been properly addressed for the gums sector compared to other agricultural and related natural resource sectors. An evaluation of the existing policies reveal that there are no policies that explicitly address the gums sector though there exist various policies that indirectly cover forest resources/commodities that are relevant to the gums sector.

SWOT analysis was undertaken to provide a comparative analysis between and among policies, laws and institutional framework in the study countries. Table 3.10 provides outcome of the analysis.

Table 3.10: SWOT analysis on policies/laws/institutions guiding production, markets and trading in gums and resins

Country	Policies/laws/ Institutions	Strengths	Weaknesses	opportunities	Threats
Burkina Faso	i. Policies ❖ National Forest Policy (PFN) ❖ Burkina Faso Forest Code ❖ Burkina Faso Environmental Code ❖ National Forest Resources Management Program (PNGRF)	❖ Concerns all forest resources	❖ Not applied specifically to gum arabic	❖ Development of forest resources (RF) ❖ Rational RF management ❖ Promotion of sustainable development	❖ Non-updating of texts: proofreading
	ii. Laws ❖ Constitution of Burkina Faso	❖ Ensures that natural resources belong to the people	❖ Not specific to gum arabic	❖ Political will displayed for the promotion and development of natural resources; ❖ Possibility of using natural resources to improve the living conditions of people	❖ Adoption of a new constitution in progress (2021
	❖ Law N ° 014/96 / ADP on Agrarian and Land Reorganization	❖ Existence of an implementing decree on the terms and conditions for the application of this law	❖ Not specific to gum arabic	❖ Political will displayed Definition of the main principles of land use of the National Land Domain	❖ The state is no longer the only landowner
	❖ Law of agro-sylvo-pastoral fisheries and wildlife guidance	❖ Securing of relations between actors in the rural world.	❖ Not specific to gum arabic	❖ Political will displayed ❖ Law favorable to more legibility and visibility of the agro-sylvo-pastoral, fishing, and wildlife sector	❖ Low level of organization of actors at all links ❖ Poor organization of the internal product market ❖ Weak forest

					resource management capacities
	iii. Institutions ❖ Ministry in charge of the environment ❖ Ministry in charge of the economy and finance ❖ Ministry in charge of Research	❖ General Directorate of the Great Green Wall ❖ Forestry Department ❖ Agency for the Promotion of Non-Timber Forest Products (APFNL) ❖ Existence of technical supervision structures ❖ Existence of APEX-Burkina ❖ Existence of the Chamber of Commerce and Industry ❖ General Directorate of Customs ❖ Realization of field and laboratory tests by the CNSF, INERA (Forest Production Department) and IRSAT (Food Technology Department)	❖ Insufficient funds ❖ Lack of real organization of the sector ❖ Availability of good seeds of gum trees	❖ Existence of technical supervision structures ❖ Existence of projects / support programs for gum arabic ❖ Export of gums ❖ Improved price competitiveness ❖ Improvement of the productivity of gum trees, ❖ Knowledge of the physico-chemical quality of gums, ❖ Promotion of local uses of gum arabic	❖ Lack of funding ❖ Malfunctioning of local committees ❖ Non-functioning of the deconcentrated structures ❖ Non-renewal of funding

Ethiopia	i. Policies ❖ National Forest Sector Development program (NFSDP) 2018 ❖ Climate Resilient Green Economy (CRGE) strategy of Ethiopia (2010/2011)	❖Established a NFSDP aiming to build considerable forest resources of Ethiopia, attract foreign investment and transform countries forestry sector to ❖Gives better incentives for forest investors ❖ Ethiopia drafted a climate resilient green economy strategy for 15 year (2010 to 2025) ❖ One of its pillars is afforestation and reforestation ❖ Enhance international relations The country has established a national	❖ Inadequate incentives to promote gum arabic production ❖ Do not have directives and legal instruments ❖ Weak capacity for enforcement ❖ Low government budget to implement the program, dependence on external source ❖ *Weak* organizational capacity, poor coordination among sectors, little government budget as well as dependence on	❖ Gives due attention for the development and commercialization of NTFPs ❖ helps to protect and re-establish forests for economic, and ecosystem services including as carbon stocks ❖ helps to conduct country climate action plan ❖ helps to improve forest resource through improved management of existing natural forests and expansion of forest cover through afforestation/reforestati	❖ Political instability, ❖ High financial burden of the country ❖ Conflicting interests in and among diffrent actors and sectors ❖ Conflicting policies and actions (Large scale agriculture and forestry) ❖ Inadequate resources for implementation of laws, plans and programmes Frequent drought and climatic changes ❖ High level of land degeradation due to deforestation agricultural expansion ❖ Frequent drought, climate change, degeradation and deforestation ❖ Conflicting policies

	❖ The National REDD+ strategy	REDD+ strategy to imrpove forest coverage	external source	on	and actions (Large scale agriculture and forestry)
	ii. Laws ❖ Gum and resin utilization and management regulation No. 001/2007	❖ Independent requlation for gum and resin production ❖ provides specific policies for gum and resin production	❖ Is not aligned with the informal institutions ❖ Not specific to gum arabic production and marketing ❖ Do not have directives and legal instruments ❖ Is not aligned with the federal forest regulations	❖ Helps to develop rules and requlation for gum arabic production and marketing ❖ Provides basic information for future policy maker to draft gum arabic policies and requlations	❖ Degradation of gum and resin producing species due to deforestation (charcoal production and agricultural expansion) ❖ Frequent drought and climate change ❖ Conflicting policies, programs and strategies
	❖ The Forest Conservation, Development and Utilization Proclamation No. 1065/2018:	❖Gives better incentives for forest investors since it is the modified version of proclamation 2007.	❖ Not specific to gum arabic production and management	❖ The proclamation mentions the integration of non timber forest prodcuts ❖ It tries to provide several incentices for forest	❖ Inadquate resources for implementation of laws, plans and programmes ❖ Political instability ❖ Conflicting

				Investors	policies, programs and strategies
	iii. Institutions ❖ Ethiopian Environmnet and forest research Institute ❖ Ethiopian Environment, Forest and Climate change commission	❖ Generate and disseminate new forestry techenologies ❖ Tries to develop tapping techniques for optimum gum and resin production and capacity building ❖ Formulation of policies and guidelines, rules and regulations for the management, conservation, and utilisation of forests including the dryland forests	❖ Lack of financial capacity ❖ Lack of expertise on gum arabic production and management ❖ Inadequate funding generally to forestry sectory ❖ Lack of specific policies for gum arabic production and marketing ❖ Lack of specific institution or sector for gum arabic ❖ Not yet decintralised to the local level	❖ Provide informations for forest policies and legislation ❖ facilitate collaboration with other sectors ❖ develop and conduct problem solving researchs related with gum arabic ❖ enforce the existing laws and regulations on non-wood forest products as well as gum arabic ❖ Adoption and domestication of international conventions, treaties and agreement related with forestry ❖ Resource mobilisation and increase budgetary support to gums and resins sector ❖ provides training and capacity building for different stakeholders	❖ Political instability, inadequate finacial and human resource and turnover of staffs ❖ Political instability and insecurity ❖ Lack of political good will from the government

	❖ Natural Gum Processing and Marketing Enterprise (NGPME) ❖ FAO-GGWSSI projects (2016 to 2018)	❖ The only gum and resin processing and markeing interprise in the countriy ❖ By processing it increases the value of gum arabic ❖ supported Integrated landscape restoration and livelihood development projects in Ethiopia ❖ Enhance restoration of ecological balance, conservation, recovery of plant and	❖ Do not have sufficent financial as well as human resource ❖ Lack of quality product due to adultération ❖ The project life span is passsed by now and no information has provided on its futurity	❖ Create marketing linkage for gum arabic product ❖ Adds value to gum arabic through processing ❖ Help to restore gum and resin producing tree species landscaps	❖ Political instability and insecurity ❖ Conflicting polices on marketing of forest resource and climate change

		animal biodiversity ❖ Increase coverage of local needs for forest products (wood and fire service, NWFPs)			❖ Political instability and insecurity, conflicting polices on marketing of forest resource and climate change
Kenya	ii Policies ❖ Vision 2030 ❖ Forest Policy ❖ A National Forest Programme (NFP) 2017-2030 Climate Change Policy enacted	❖ Blue print for economic development, supports 10% tree cover & healthy environment ❖ A comprehensive strategy on forestry development ❖ County Climate Change Action Plans in Place	❖ Lack of adequate budgetary support to Forestry Issues ❖ No recent Forest Policy ❖ Inadequate incentives to promote gums and resins for the private sector and amog youth and women ❖ County Climate Change Action not Implemented ❖ Lack of resources to implement the County spatial plans	❖ Development of County Forest Policies aligned to the Vision ❖ Draft policy mentions integration of NWFPs in development of forest sector ❖ Develop financial products and credit facilities for gums and resins ❖ Support to Implementation of County Climate Action Plans	❖ Conflicting interests among actors and lack of clarity of devolved/shared functions ❖ Lack development of relevant instruments for proper development of forest sector ❖ Inadequate budgetary support to NWFPS at National and County levels ❖ Climate Change threats to gums and resin and their production ❖ Land degradation and declining natural populations

Kenya	ii Laws ❖ The Constitution of Kenya (2010) ❖ Forest Conservation and management Act No.40 of 2016 ❖ Draft Forest (gums and resins Rules) 2018 ❖ Environmental Conservation & Management Act 2015	❖ The Constitution elevates forestry & environmental issues to a higher moral and legal level ❖ Constitution provides requirements for multi-stakeholder participation in formulating policies and legal instruments. ❖ Law has compréhensive provisions in addressing sustainable forestry management issues including drylands ❖ Regulation for development of the sector in place ❖ Guarantees environmental quality as a human right ❖ Environmental management committees in place at subcounty and ward level	❖ Inadequate mechanism for achieving for 10% tree cover ❖ Lack of domesticated county forest laws for implementation by county government ❖ Weak capacity for enforcement and self regulation of the Forest Law in the counties and communities ❖ Rules not gazzeted and hence not enforceable ❖ Most of the environmental management committes not functional ❖ Conflict between environmental management committees & Use groups in CFAs'	❖ Implement national strategy for achieving and maintaining over 10% tree cover by 2022 at county and national levels. ❖ Develop county law prototype to domesticate national forest law aligned to dryland forests that is in tandem with community land tenure ❖ Present opportunity for development of the sector ❖ Develop guidelines for environmental management committees & use groups in CFAs tailored for gums and resins in Asals	❖ Political interference in key policy and legal issues in the forestry sector ❖ Inadequate resources for implementation of laws, plans and programmes ❖ Forest degradation due to unsustainable forest practices ❖ Increased forest degradation and challnges in quality control and value addition ❖ Increased ecosystem degradation and conflict of interests among stakeholdrs ❖ Duplication and contradiction of roles between

					environmental committees and and Community Forest Associations
Kenya	iii. Institutions ❖ Kenya Forest Service	❖ Formulation of policies and guidelines, rules and regulations for the management, conservation, and utilization of dryland forests ❖ Develop forest management plans in collaboration with relevant owners ❖ Issuance of movement permits ❖ competent authority for enforcement of	❖ None enactment of draft Gums and resins rules and regulations, hence enforcement ❖ Lack of business incubation opportunities ❖ Inadequate funds and technical capacity in the Counties to support the gums and resins value chain ❖ Inadequate staff and skills in gums and resin	❖ Enforce compliance of existing laws and regulations on NWFPS. ❖ Ratification adoption and domestication of international conventions, treaties and agreement in forestry ❖ Establish business incubation center in Karura and gums and resin producing counties ❖ Lobby for the enactment of the draft natural resources (benefits sharing bill) and the draft Forest (Gums	❖ Lack of political good will at county and national levels ❖ Recurrent droughts and insecurity ❖ High turn over of experienced staff

	❖ Kenya Forestry Research Institute ❖ GARA established since 1997	gums rules and regulations and development of gums and resins management plans ❖ R&D portfolio (generate, disseminate & build capacity) ❖ Has facilities for establishing business incubation, processing and analysis ❖ Lobbying, advocacy and Mobilization of key stakeholders ❖ Training and capacity building of extension service providers in collaboration with key partners ❖ Works closely with NGARA for development of the sector	❖ Inadequate incubation platform for processing and value addition ❖ Inadequate coverage of the gums and resins in counties ❖ Inadequate funding to forestry and gums and resins ❖ Poor roads and infrastructure in gum producing areas ❖ Double taxation of gums and resins ❖ Lack of suitable policies and legislation	and resins) regulations ❖ Resource mobilization and increase budgetary support to gums and resins ❖ Increase training and capacity building ❖ Promote business incubation and mentoring ❖ Enact forest policies and legislation ❖ Harmonise taxes/movement permits/cess ❖ Restructure GARA to be a vibrant self-sustaining Association ❖ Strengthen collaboration with NGARA	❖ Insecurity and drought ❖ High turnover of experienced staff ❖ Recurrent drought & insecurity
Mali	i. Policies ❖ The Gum Arabic Sector Strategy	❖ Embraces all players in the gum arabic sector	❖ Only carries the gum arabic sector	❖ A unique strategy in the field of gum arabic and very timely to reduce the poverty of populations in production areas and encourage their protection	❖ Overuse of gum exudation capacities

	❖ National Strategy for the Promotion of Non-Timber Forest Products (NWFPs)	❖ Embraces all stakeholders in the NWFP sector including gum arabic	❖ The operators believe that operating taxes are high especially for products intended for export given the continental aspect of the country	❖ Allows the promotion of certain NTFPs and encourages their protection	❖ Overuse of gum exudation capacities
	ii. Laws ❖ Law N ° 68 – 8 AN-RM of February 17, 1968 on the Forest Code ❖ Law No. 2010-028 of July 12, 2010 on the exploitation and marketing of gum forestry resources	❖ Focuses on the management of all forest and wildlife resources; ❖ Deals with the commercial exploitation, circulation, storage and national, sub-regional and international trade of forest products	❖ Not specific to the management of gum resources ❖ Not specific to the management of gum resources	❖ Legislative reference for the management of forest resources ❖ Better organization of the exploitation of NTFPs including gums	❖ Risks of overexploitation of the species ❖ The *Vachelia seyal* species, which produces friable gum arabic, is not fully protected
	iii. State institutions ❖ National Directorate of Water and Forests ❖ Socio-professional organizations of stakeholders	❖ In charge of the application of the regulations in terms of exploitation and marketing of NTFPs including gums ❖ Producers' cooperatives; ❖ Unions of cooperatives;	❖ Insufficient forest managers ❖ Insufficient organization at the various segment of the value chain	❖ Good knowledge of the sector and of the legislation governing the management of NTFPs in general ❖ Better organization given the current needs of good management of the sector.	❖ Behavior of communities after the transfer of forest resources to communities ❖ Overexploitation of the resource; ❖ Conflicts between operators (local and foreign)

		❖ Federations; ❖ Interprofessional			
Niger	i. Policies and strategies ❖ Sustainable Development and Inclusive Growth Strategy-Niger 2035. ❖ National Forestry Policy and 3N Initiative ❖ National strategy for reviving the production and marketing of gum arabic in Niger ❖ Strategy and Action Plan for the Promotion of Non-Wood Forest Products (NTFPs) in Niger	❖ Build a modern, democratic and united, well-governed and peaceful country, open to the world, as well as an emerging economy, based on a balanced sharing of the fruits of progress. ❖ Adopted through the Decree n ° 2012-139 / PRN of April 18, 2012 ❖ Government strategy adopted in 2003 ❖ Government strategy adopted in 2016 and covers 16 Non-Wood Forest Products (NWFP) including gum arabic and resins	❖ Lack of willingness for achieving the change of the paradigm that could lead to the achievement of this developmental strategy ❖ Lack of financial resources for the implementation of the various contained ❖ Only for gum Arabic. It does not take into account gum form Combretum nigricans ❖ It does not take into account the organizational framework of gum stands exploitation and marketing of gum Arabic and sharing of the revenue amount stakeholders at all levels ❖ About 16 species have been identified to be	❖ Could lead to the development of the Country through wise use of all the national forestry and other land resources ❖ Advocacy and resource mobilization document for resources mobilization for achieving the objectives of the 3N Initiative for forestry management actions for the next ten years. ❖ A single strategy in the field of gum arabic and very anchored in rural areas	❖ Difficulties of creating a minimum national consensus on the major challenges and small numbers on essential priorities areas for action. ❖ Fight over the little financial resource because clear priorities not been clearly established ❖ Exist since 2003. Need to be revised and updated ❖ Each region fights over for the promotion of non-timber forest

			promoted in the 8 regions of the country	❖ Covers 16 Non-Wood Forest Products (NWFP) including gum arabic and resins	products on which it has a clear comparative advantage. This fight is slowing down the efforts of foresters at the national leve
	ii. Laws ❖ National Constitution of 2010 ❖ Law 2004-040 establishing the Forest Code of Niger	❖ Guarantee a healthy environment to everyone ❖ Compulsory for the State to protect the environment for the benefit of present and future generations ❖ Embraces the management of all forest resources	❖ nsufficient financial resource for supporting the protection of the environment ❖ Not specific to the management of gum resources	❖ Development of the Country through wise use of all the national forestry and other land resources ❖ Its implementing decree opens the way for taking into account the specificities	❖ Conflicting interests over the few financial resource and lack of the development of clear priority ❖ Lack of financial resource and reluctance of forestry officers
	iii. Institutions ❖ The Directorate General of Forestry ❖ The National Agency of the Great Green Wall Initiative ❖ The National Association of	❖ Formulation of policies and guidelines, Rules and Regulations for the management, conservation, utilization of the forest resources and establish norms and standards of the exportation ❖ Training and capacities building with other partners. ❖ About 12,000 people	❖ Lack of the sufficient financial resource for expanding the action plans ❖ Lack of financial	❖ Demands on gum arabic and resins is very high and not meet at any time. There is therefore room for expansion ❖ Diversity of actors from the different segment of gums value chains	❖ Recurrent droughts and insecurity in the production areas ❖ Complexity in coming to a national consensus ❖ Lack of initiatives

	Gum Arabic Producers and Exporters ❖ The Directorate of Foreign Trade through the Directorate of Norms and Standards of the Ministry of commerce ❖ Institutions of Research and Training such as INRAN and IPDR-Kollo	constitute this umbrella association ❖ Help the exporter meeting the norms and standard of international trade ❖ Guide the exporters establishing contracts with foreign' buyers ❖ Training and capacities strengthening on gums technics to meet the international markets norms and standards	resource for organizing their own training and capacities building ❖ Lack of financial resource for organizing their own training and capacities building	❖ Existence of many projects and programmes for supports ❖ Existence of many projects and programmes for supports	from the local gum actors ❖ Lack of initiatives from the local researchers
Nigeria	i. Policies ❖ National Accelerated Industrial Crops Production Programme 1994 ❖ Transfer of gum arabic from Ministry of Environment to Ministry of Agriculture 1994	❖ Promotion of production of eight crops with high industrial raw materials potentials including gum arabic ❖ Encouraged domestication and cultivation of gum arabic in plantations	❖ Lacked sustainability plan ❖ Not dedicated to gum arabic ❖ Supported only grade one gum arabic ❖ Capital intensive ❖ Lack of enabling rules and regulations that promote sustainable private sector investment in the	❖ Mass production of certified grade one gum arabic planting materials ❖ Massive expansion of gum arabic hectarages in gum arabic growing belt ❖ Guaranteed availability of future supply of grade one gum arabic in Nigeria ❖ Large scale cultivation of gum arabic in plantations across gum arabic producing states	❖ Poor funding ❖ Lack of continuity ❖ Recurrent drought and desertification ❖ Frequent browsing of young gum arabic plantations by

			sector		free range ruminants animals
	❖ Gum arabic production inputs support scheme 2017- 2020	❖ Availability and affordability of gum arabic critical production inputs such as fencing wires, planting materials, tapping knives etc ❖ Strategy that averts conflicts that arise from tresspassing of plantations by free range ruminant animals ❖ Encouragement of investors into gum arabic plantation establishment and development	❖ Inconsistencyies in funding ❖ Prone to abuse ❖ Inadequate inputs	❖ Availability of gum arabic critical production inputs at highly subsidized rates ❖ Perimeter fencing of gum arabic plantations with fencing wires and angle iron bars that would have hitherto be unaffordable by farmers	❖ High cost of fencigng commercial gum arabic plantation ❖ Inadequate funding ❖ Insecurity (Boko Haram, cattle rustlers, armed bandicts, kidnappers etc.) in the region
	❖ Forest policy 1988	❖ Consolidation and expansion of the forest estate and its management for sustainable yield ❖ Forest conservation and protection of the environment ❖ Forest regeneration at a greater rate than exploitation ❖ Protection of forest from fire, poachers, trespassers and unauthorized grazers	❖ Lacked enabling rules and reguslations for enforcement ❖ No strict adherence amd compliance to environmental protection and management ❖ Poor enforcement	❖ Assist in building and strengtening capacity of communities by providing alternative sources of livelihood ❖ Creates opportunity for community mobilization, formation of women, youth groups and cooperatives ❖ Job creation for example hunting and gathering of NTFPs ❖ Creates opportunity for formation of NGOs,	❖ Hide out for insurgents (Boko Haram, cattle rustlers, armed bandicts, kidnappers etc.) in the region ❖ Obsolete policy

		❖ Development of more efficient use of wood energy and alternative sources of wood fuel ❖ Encouragement of private forestry ❖ Encouragement of agroforestry ❖ Development f more efficient use of wood energy and alternative source of fuel wood ❖ Supports capacity bilding and exchange programme ❖ Develops market for forest envirnmental services		CBOs at local levels and associations at national levels for advocay and lobbying ❖ Supports capacity building of stakeholders and exchange programmes ❖ Promotes inter sectoral discussions and exchange of informtion ❖ Promotion of agrro-forestry andd food security ❖ Advocacy and awareness campaign on the effects of desertification, indiscriminate felling of trees, bush fire etc ❖ Creates opportunity for community involvement PRA in the establishment and management of forest reserves, communty woodlots, shelter belts etc. ❖ Encourages production and planting of improved multipurpose planting materials.	need to be reviewed ❖ Drought and desertification ❖ Population pressure ❖ Deforestion for urbanization, agriicultture, fuel wood etc.
	ii Laws ❖ Establishment of Rubber Research Institute of Nigeria under Nigeria research institute act No 33 of 1964.	❖ Special focus on gum arabic research and development in Nigeria ❖ Improvement of genetic potentials of	❖ Inadequate funding ❖ Poor budgetary allocation ❖ Poor budget performance ❖ Inadequate infrastructures	❖ Development of technological inovations for intervention in natural rubber production, product development, marketing etc. ❖ Development of	❖ High turn over of scientists ❖ Poor funding

		natural rubber and other gums and resin crops ❖ mprovement of agronomic practices including cultivation and exploitation techniques ❖ Improvement in processing, preservation, storage and utilization of rubber, gum arabic and their derivatives ❖ Development of control measures against pests and diseases of rubber, gum arabic and other latex producing plants ❖ Farming systems in relation to rubber, gum arabic and other latex-producing plants ❖ Has capacity for xtension and training		knowldge products ❖ Production of training manuals ❖ Job creation ❖ Capacity building of value chain actors	

	ii Institutions ❖ Rubber Research Institute of Nigeria, Gum Arabic Sub Station Gashua 1995 ❖ National Association of Gum Arabic, Producers, Processors and Exporters of Nigeria (NAGAPPEN) 2000	❖ Special focus on gum arabic research and development, and co-ordination of gum arabic activities in the 12 gum arabic producing states ❖ Availability of well trained manpower for R&D functions, technical and allied services matters. ❖ Capacity for man power and development ❖ Has capacity for procurement and storage of gum arabic before export ❖ Lobby, adocacy and liaises between its members and government/other stakeholders. ❖ Works closely with NGARA to bring about necessary change and development of gum arabic secctor ❖ High and strong memship base	❖ Lack of authonomy ❖ Poor funding ❖ No direct budgetary allocation ❖ In adequate infrastructures ❖ Lack enabling policies and regulations for advocacy, lobby etc. ❖ Inadequate funding ❖ No special focus on the development of	❖ Development of technological inovations for intervention in gum arabic production, product development, marketing etc. ❖ Development of knowldge products ❖ Production of training manuals ❖ Job creation ❖ Capacity building of value chain actors ❖ Development of model gum arabic planting materials producion infrastructures in some of the resource producing states ❖ Creates vibrant market and trade of gum arabic ❖ Training of members ❖ Financing of local trade ❖ Interfacing with government and NGOs to improve the sector	❖ High turn over of scientists ❖ High level of insecurity in the region ❖ Poor funding ❖ Weak collaboratins with institutions providing support for the sector ❖ Lack of authonomy ❖ High level of insecurity ❖ Climate change and climate variabilities ❖ Drought and desertification

	❖ Federal Ministry of Agriculture and Rural Development Develoment ❖ Federal Ministry of	spread across 12 gum arabic producing states ❖ The host ministry for gum arabic resource ❖ Priority instution of government ❖ Gets reasonable budgetary allocation annualy ❖ Supervises gum arabic value chain activities under agricultural transformation agender of federal government ❖ Provides support for special interventions in gum arabic value chain activities ❖ Supervisory ministry for gum arabic research and development including genetic and agronomic improvements, product development, processing, extension and	gum arabic sector by federal government. ❖ Inadequate infrastructure ❖ Poor funding gum arabic sector ❖ Government policy that establshed the Gum Arabic Research Sub Station of RRIN subjugated it hence poor fundng and under development ❖ In adequate funding ❖ Trades on all non oil	❖ Gum arabic has massive area of coverage. It is produced in 12 states ❖ Gum arabic production and trade could create jobs and provide employment for our teeming youth and women who are mostly the value chain actors ❖ FMARD provided support for production and procurement of gum arabic production inputs that are sold to farmers at highly subsidized rates ❖ In 2020 federal government gave gum arabic seedlings free to farmers as part of its COVID-19 palliatives ❖ Promote trade and export of non oil commodities	❖ Lack of authonomy ❖ High level of insecurity ❖ Poor funding ❖ In adequate funding funding ❖ Insecurity in some of the regions where many of the non oil commodites are

	Industry Trade and Investmen ❖ Federal Ministry of Environment	socioeconomic studies ❖ The ministry formulates policies that help to create wealth and employment reduce poverty, enchance service delivery in a maner that stimulate growth of the economy through trade, industrialisation and investment ❖ Promotes trade on gas and non oil commodities including gum arabic ❖ Protects environment ❖ Ensures natural resources conservation ❖ Promotes sustainable development of the environment	commodities and gas. Does not specialize on gum arabic ❖ Not deedicated to gum arabic services. ❖ Uses gum arabic species only in its afforestation and climate change policies, actions and priogrammes.	❖ Capacity building of value chain actors ❖ Supports value adding activities of non oil commodities ❖ Capacity building of actors along the value chains ❖ Supports value adding activities ❖ Creates opportunity for community mobilization, formation of women, youth groups and cooperatives ❖ Job creation for women and youth mostly engaged in hunting and gathering of NTFPs	obtainged ❖ Drought and desertification ❖ Population pressure ❖ Deforestation for urbanization, agriculture, fuel wood etc. ❖ Insecurity in most areas of operations

Senegal	i. Policies ❖ Green Senegal Emergent Programme (Green PSE)	❖ Support for all development issues	❖ Insufficient coordination between state branches and development partners	❖ Political commitment of the authorities through the various ministerial departments	❖ Lack of financial resources to deal with COVID 19 and flooding
	ii Laws ❖ Law No. 2001-01 of January 15, 2001, on the Environment Code; ❖ Law 2018-25 of 12 November 2018, on the forest code and its implementing decree; ❖ Law 96-07 of March 22, 1996 relating to the transfer of powers to the regions, municipalities and rural communities; ❖ Law 96-06 of March 22, 1996, on the code of local	❖ Availability of laws in all areas related to sustainable development	❖ Insufficient harmonization of the various laws	❖ Political engagement	❖ Lack of awareness of the laws by the actors

	authorities; ❖ Law 86-04 of January 24, 1986 regulating hunting and its implementing decree; ❖ Law 64-46 of June 17, 1964, relating to land management.				
	iii Institutions ❖ Department of Water, Forests, Hunts and Soil Conservation (DEFCCS) ❖ Senegalese Agency for Reforestation and the Great Green Wall (ASERGMV)	❖ Strong institutionalization of development issues	❖ Insufficient means for the implementation of reforestation programs	❖ Networking of the entire territory in terms of human resources	❖ Level of involvement of local authorities is lacking
South Sudan	i. Policies ❖ CAMP (Comprehensive Agriculture Master Plan) ❖ South Sudan Forest Policy 2015 ❖ Climate Change Policy enacted	❖ Develop many projects in forest sector ❖ Forest policy is already in place ❖ Climate change policy in Place	❖ No adequate budgetary to implement those projects ❖ Poor Forest Policy implementation ❖ Climate Change policy not Implemented ❖ Lack of resources to implement the climate change policy	❖ Development of CAMP ❖ Development of policy for the NTFP ❖ Develop financial products and credit facilities for gums and resins ❖ Support by the government for the Implementation of Climate change policy	❖ Lack of relative peace to implement those projects ❖ Lack of development of relevant forest law for the forest sector ❖ Inadequate budgetary support to NTFPS at National and County levels ❖ Climate Change threats to gums and resin and their production in most part of gum

					production areas ❖ Land degradation and declining natural populations due to charcoal burning and others
	i. Laws ❖ Republic of South Sudan Constitution 2011	❖ The Constitution promotes forestry & environmental issues to a higher moral and legal level ❖ Constitution provides requirements for multi-stakeholder participation in formulating policies and legal instrument ❖ Regulation for development of the	❖ Lack of forest bill in place ❖ Lack of forest laws for implementation by State government ❖ Weak capacity both at	❖ government vision of cutting one plant ❖ Develop county law prototype to domesticate national forest law aligned to dryland forests that is in tandem with community land tenure ❖ Higher opportunity for development of the sector	❖ Political interference in key policy and legal issues in the forestry sector ❖ Inadequate resources for implementation of laws, plans and programmes ❖ Forest degradation due to unsustainable

	❖ Environmental Conservation & Management Act 2015	sector in place	National and State for enforcement and self-regulation of the Forest Law in the State, counties and communities ❖ committees & Use groups in CFAs'	❖ Develop guidelines for environmental management committees & use groups in CFAs	forest practice ❖ Increased forest degradation and challenges in quality control and value addition ❖ Increased ecosystem degradation and conflict of interests among stakeholders ❖ Duplication and contradiction of roles between environmental committees and Community Forest Associations

	i. Institutions ❖ Ministry of Environment and Forestry	❖ Formulation of policies and guidelines, rules and regulations for the management, conservation, and utilization of dryland forests ❖ Develop forest management plans in collaboration with relevant owners ❖ Issuance of certificate of origin and Phytosynanetary certificates ❖ competent authority for enforcement of gums rules and regulations and development of gums and resins management plans ❖ Lobbying, advocacy and Mobilization of key stakeholders ❖ Training and capacity building of extension service providers in	❖ None enactment of draft Gums and resins rules and regulations, hence enforcement ❖ Inadequate funds and technical capacity at both National and State to support the gums and resins value chain ❖ Inadequate staff and skills in gums and resin ❖ Inadequate funding to forestry and gums and resins ❖ Poor roads and infrastructure in gum producing areas ❖ Double taxation of	❖ Enforce compliance of existing laws and regulations on NTFPS. ❖ Ratification adoption and domestication of international conventions, treaties and agreement in forestry ❖ Establish business incubation centers in gum producing areas ❖ Lobby for the enactment of the draft natural resources (benefits sharing bill) and the draft Forest (Gums and resins) regulations ❖ Resource mobilization and increase budgetary support to gums and resins ❖ Increase training and	❖ Lack of political good will at both National and State levels ❖ Lack of relative peace and insecurity ❖ Lack of experienced staff

		collaboration with key partners ❖ NGARA is the potential development partner for development of the gum Arabic sector	gums and resins ❖ Lack of suitable policies and legislation	capacity building ❖ Promote business incubation and mentoring ❖ Enact forest policies and legislation ❖ Harmonise taxes/movement permit	

3.11 Strengthening relevant institutional framework at country level with proper multi-sectoral coordination at national and regional levels

3.11.1 Profile and review existing institutional frameworks and arrangements

There exist several institutions in producer countries involved in the gum arabic sector but there is lack of proper coordination and documentation. Below is a brief highlight on institutional arrangements in the producer countries.

The forestry sector in **Burkina** Faso is organized under the Ministry of Environment, Green Economy & Climate Change (MEEVCC), which is responsible for the formulation of policies/laws in forestry & Natural Resources. There is the directorate of forestry as well as regional and provincial directorates that implement policies/laws in forestry & collect and process statistical data on gum arabic, including carrying out inventory, assessment of tree stands and management of forest resources, among other responsibilities.

Burkina Faso has also organizations in gums and resins sector but not properly organized as yet. For example, there exist various unions in the gums sector like Regional Union of Gum Producers (URPGA), which face challenges as URPGA is not the same everywhere. There is also Association of Professional Exporters of Gum Arabic (APEGA) and Export Promotion Agency of Burkina Faso (APEX). There is urgent need to re-organize these organizations for the benefit of the gums and resins sector.

In **Chad** – The gum arabic sector is organized under the Ministry of Environment through its affiliated organizations and representatives at local levels. This Ministry of Environment is supported by the Ministry of Commerce in organizing the export of the produce. Other important institutions supporting the gum arabic sector include:

- ATPGA: Chadian Association for the Promotion of Arabic Gum: created in 1999 by the AFD gum project, it mainly brings together exporters and wholesalers from the wireless market. It also provides financial support for the establishment of gum plantations and management to associations and unions of gum arabic,
- IRBATH: Gum arabic Exploitation Cooperative: association of wholesalers. It supports in the formulation of the gum tree planting project. It also represents the wholesalers particularly in the wireless markets,
- CCIAMA: The Chamber of Commerce, Industry, Agriculture, Mines and Handicrafts: as part of its mandate to promote the Chadian economy. It participates in the promotion of Chadian gum arabic, because of its weight in the national economy,
- ANIE: The National Investment Agency which mandate is the promotion of the sector to international investors. ANIE is particularly responsible for

monitoring Chad's registration file for the GSTP, allowing it to benefit from customs facilities for exporting gum arabic to India,

- CIC-GA: Inter-professional Consultation Committee of the Gum arabic sector:

It should be noted, all these bodies, some of which established PAFGA - Support project for the gum arabic sector – such as the CIC-GA, IRBATH, etc. are not meeting their objectives, because mainly of lack efficient capacities and financial support. This need special attention by FAO and NGARA through the SURAGGWA programme.

Ethiopia has several institutions involved in gums and resins but not properly coordinated. The lead organization is the Natural Gum Processing and Marketing Enterprise (NGPME), which is the sole state marketing institution that buys gum and resin in the country. NGPME nowadays accounts for about a third of the trade volume of the gums and resins sector. Then there is the producer cooperatives engaged in production of gum and resin and trader cooperatives engaged only in marketing of gum and resin (Teshale, 2011). The cooperatives were established based on the premise of improving the livelihoods of the local people and promoting the management of the Acacia, Boswellia and Commiphora resources. However, the gums and resins sector has been liberalized and private traders are the major market actors.

The management of gums and resins by the government is vested with the state agencies such as the administration council and offices of pastoralist and agriculture development at the Kebele (smallest administrative unit) and district levels, which are the main agencies responsible for the natural resource management affaires. They influence gum and resin production and trading by promoting gum and resin cooperatives, and endorsing individualized enclosures for farming and grazing. They also contribute to gum and resin production and marketing by stimulating the establishment of gum and resin cooperatives. Currently, Ethiopian Environment, Forest and Climate Change Commission, Regional states Environment, Forest and Wildlife Protection and Development Authority and District and Kebele administrative play a big role for cooperative establishment.

The above analysis shows that the sector needs to be re-organized to integrate the private sector, which is the main driver of the sector with the government providing an enabling environment through formulation and enforcement of appropriate policies and laws.

Kenya has strong government institutions in forestry for the development of the gum arabic sector. They include Kenya Forest Service (KFS) and Kenya Forestry Research Institute (KEFRI). KFS is the lead agency in the conservation,

sustainable development, management and utilization of the country's forest resources for equitable benefit of present and future generations. It has a program on dryland forestry, which covers aspects of promoting conservation and management of dryland resources with a focus on the development of dryland tree-based nature enterprises including gums and resins. However, this function has not been fully developed apart from issuance of movement permits for those trading in gum Arabic. The agency can play a more active role by registering the CFAs in the counties producing gum Arabic and working through them in the conservation including landscape restoration and sustainable production of the commodity through sound tapping and post-harvest handling.

KEFRI is the national lead agency in forestry research for sustainable development. Among its strategic objectives in the current strategic plan (2018-2022) is generation of technologies for sustainable landscapes including woodlands, efficient processing and use of wood and non-wood forest products, policies for sustainable forest management and improved livelihoods. To accomplish these objectives, it has established five research and development themes that adequately address the dryland ecosystem. Indeed KEFRI has and continues to provide leadership in the development of the gums and resins sector in the country.

Other government agencies relevant to the gum Arabic sector include the Kenya Plant Health Inspectorate Service (KEPHIS), Export Promotion Council (EPC) and Kenya Bureau of Standards (KeBS). KEPHIS normally issues phyto-sanitary certificates whenever they are required by overseas importers for food grade gum Arabic. EPC is an important agency in documenting the export and import of different commodities including gum Arabic. The challenge encountered is weak coding where different commodities are lumped together requiring caution while analyzing the data. This is an area where close collaboration is called for between KEFRI, KFS and EPC to streamline coding and ensure proper recording. KeBS is an important agency on standardization of products but has not been involved with gum Arabic.

Finally, Kenya is one country that has established the Gum Arabic and Resins Association (GARA) to articulate interests of the sector. GARA was registered in 1997 as a NGO and comprises of individuals and corporate organizations including user groups at the grassroots. However, GARA needs a strong secretariat to effectively lobby for the sector. A clear coordination mechanism with the above government agencies will enhance development of the sector.

In **Mali,** the main institutions relating to the management and protection of natural resources and the environment in general and of non-timber forest products including gum arabic are:

i. State structures :

- ❖ Ministry of the Environment, Sanitation and Sustainable Development
- ❖ Ministry of State Domains: Within the framework of the project, it intervenes for the aspects related to land tenure security that would benefit gum producers;
- ❖ Ministry of Agriculture - is in charge of quality control of agricultural products including gum arabic.
- ❖ Ministry of Investment Promotion (MPI-Mali - for investment activities in the total or partial processing of gum.
- ❖ Ministry of Trade and Competition - within the framework of the project, it intervenes for activities related to the promotion of internal and external trade of gum arabic. As such, it has initiated and is implementing the "Project to strengthen the productive and commercial capacities of the gum arabic sector in Mali".
- ❖ Agency for the Promotion of Exports APE;

ii. Non-state structures :

- ❖ Regional Assemblies of Kayes, Segou, Koulikoro, Mopti, Timbuktu ;
- ❖ Permanent Assembly of Chambers of Agriculture (APCAM);
- ❖ Federations and Confederations of the actors of the sector;
- ❖ Interprofession of the gum sector in Mali (IF-Gomme/Mali). The latter is the union of two confederations of actors: producers and collectors/exporters with divisions up to the communal level. However, it is not properly structured.

In **Niger** the gum arabic sector is under the Ministry of Environment, which is responsible for the formulation of policies/laws in forestry & Natural Resources and the Directorate of Green Economy that is the implementing agency. There is also the Niger Association of Gum Arabic Exporters (ANGA) but it needs strengthening. Additionally, there exist user groups, cooperatives and associations for other agricultural commodities where gum Arabic can be easily incorporated.

Nigeria has strong institutions that provide strong support to the gum arabic sector. The Rubber Research Institute of Nigeria (RRIN) under Federal Ministry of Agriculture and Rural Development (FMARD) is the lead institution for carrying out research into production and development of gum arabic among other plants of economic importance in Nigeria. Her mission is to continuously provide innovations that will develop and transform the gum arabic and other industrial crops by applying cutting edge scientific know-how delivered by motivated,

dedicated and highly trained manpower in a manner that sustains the ecosystem with maximum economic benefits to Nigerians. It delivers on its gum arabic mandate at the Gum Arabic Research Sub Station Gashua, Yobe state.

The country has also other institutions relevant in the development of the gum arabic sector. They include the Standards Organization of Nigeria whose functions include preparation of standards and certification of products among others. However, is has not been involved in gum arabic as at now though the potential exists. The National Great Green Wall is an important agency in tackling the detrimental social, economic and environmental impacts of land degradation and desertification in northern Nigeria. Gum trees have been identified as among key species for the rehabilitation of degraded landscapes and improvement of livelihoods. The Nigeria Customs Service has the responsibilities to collect accurate import and export data for economic statistical usage and planning. This is an important agency that can help in proper documentation of trade statistics of gum arabic including coding. However, there is need to develop the capacity required by closely working with the relevant forestry agencies and private sector.

On a positive note Nigeria is one of the countries that has established a strong association in gum arabic. The National Association of Gum Arabic Producers, Processors and Exporters Association of Nigeria (NAGAPPEN) is a private sectors gum arabic commodity value chain association established in Nigeria. NAGAPPEN comprises of members from gum arabic producers (over 200 groups), processors and exporters. It maintains state chapters of the association in gum arabic producing states of North West and North Eastern Nigeria with facilities for procurement and storage.

Nevertheless coordination of the various institutions supported by enabling legal and policy environment remains a big challenge in the country.

In **Senegal** the Directorate of Forestry (Forest Service) is the key agency in the conservation and management of forest resources. The service provides support to local populations and NGOs in their reforestation efforts, notably through the free supply of seedlings. In 2019, the Senegalese Agency for Reforestation and the Great Green Wall (ASERGMV) was established to develop reforestation actions at the national level and take into account the planting of acacia trees, especially in gum tree areas such as Ferlo covering the regions of Louga, Matam, Saint-Louis and Tambacounda. Senegal has a processing company - Valdafrique in the Dakar region, which is supplied mainly by traders in the Ferlo area (Dahra, Linguère, Ranérou). This company produces pastilles based on gum arabic and atomized gum.

Development of a strong coordinated private sector in Senegal through establishment of producer associations is still weak. However, plans are underway to strengthen a dynamic gum arabic sector where it is planned to set up a Senegalese association of gums and resins (ASEGORE) in the long term plan. A number of activities will be carried out within this framework for further development;

- Updating of natural resource maps in collaboration with the Ecological Monitoring Center for Natural Resource Management (CSE). There are maps at the national level of the distribution of gum-producing species i.e. *S.senegal, V. seyal* and *Sterculia setigera*, which will need updating,
- Surveys of the gum arabic marketing markets. To this end, a map of the location of gum marketing channels will be produced at the national level,
- Development of a database (Microsoft Access) on gums and resins (location area, processing, marketing, demography, project, legal framework, bibliography, survey sheets, representation of maps of plantations, consultation). This database can be used by NGARA and fed by all the countries involved. It can also take into account other local development sectors,
- Collaboration with private sector including Asylia Gum Company, and
- Inventory of existing associations in the gum sector (producers, traders, exporters...).

An inter-ministerial committee of experts, chaired by the Minister in charge of the Environment, and in collaboration with the Representatives of Professional Associations, will periodically monitor the planned activities.

At regional level there exist organizations with expertise in gums and gum-resins that are valuable for the development of the sector. NGARA and AFF are developing the needed capacities in the producer countries.

In **South Sudan**, the only capable and available institution for gum Arabic management is the Ministry of Environment and Forestry, however the institution needs to develop relevant policy for the NTFP and develop financial products and credit facilities for gums and resins. Currently, the Ministry of Environment and Forestry (MoE&F) is lacking relevant forest law for the forest sector and inadequate budgetary support to NTFPs at National and County levels. There is no forest bill in place and weak capacity of both National and State governments for enforcement and self-regulation of the Forest Law in the State, counties and communities.

Therefore, to re-organize and strengthen development of gum arabic and resins in South Sudan, MoE&F should develop relevant bill for gum Arabic sector,

implement the government vision of cutting one plant five, develop county law prototype to domesticate national forest law aligned to dryland forests that is in tandem with community land tenure and government should allocate enough funds.

The status of gum and resins association in South Sudan varies from one State to another, for example in Kapoeta South in Eastern Equatoria State, there is no association in place for gums and resins, while in Renk and Wadkon of Upper Nile State they have associations for gums and resins but the capacity of the association is weak and lacking funds for running the association and no relevant laws to govern the associations.

To strengthen the status of gums and resins association in South Sudan, there is also need for creating awareness and training in how to tap, collect, sort and storage, further more they also need training on how to form associations and how to write constitutions.

NGARA, FAO and other developmental agencies need to build capacities of the existing associations and train them on how to form the association and make them aware on the important of formations of associations, demarcate boundaries of individual gum areas to avoid conflict, because when communities become aware about the economic value of gum to their livelihood, it will create tensions among themselves. Moreover, they need to be assisted through funding.

NGARA is a Pan African organization registered in Kenya as a Non-Governmental Organization (NGO) and hosted at the Kenya Forestry Research Institute (KEFRI) with as mission to assist African producing countries and partners in formulating a coordinated strategy for the sustainable development of their natural gums, resins and allied dryland resources and commodities, for improving rural livelihood and environmental conservation. With a membership of sixteen countries across the African Sahel and Horn of Africa and an institutional organization constituted of focal points and private sector partners in each member country, NGARA has implemented various projects in similar topics with several partners such as FAO, CIRAD and the governments of Uganda and Somalia. Currently, NGARA is implementing two studies by FAO and one through AFF. These are; “Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa’s Drylands that is being implemented in six NGARA member countries of Chad, Ethiopia, Mali, Nigeria, Senegal and South Sudan; and, support to the formulation of a GCF project on: Scaling-Up Resilience in Africa’s Great Green Wall (SURAGGWA)” in the Six Sahel countries of Burkina Faso, Chad, Mali, Niger, Nigeria and Senegal for FAO and “Strengthening capacity among

stakeholders for the production and trade in gums and resins in Africa" in Burkina Faso, Kenya, Niger and Tanzania for AFF.

The **African Forest Forum (AFF)** is a pan-African non-governmental organization with its headquarters in Nairobi, Kenya. The purpose of AFF is to provide a platform and create an enabling environment for independent and objective analysis, advocacy and advice on relevant policy and technical issues pertaining to achieving sustainable management, use and conservation of Africa's forest and tree resources as part of efforts to reduce poverty, promote gender equality, and economic and social development. Through all its programmes and activities, AFF seeks to promote the empowerment of all marginalized groups, particularly women, who have remained vulnerable to the impacts of climate change and whose representation, priorities and needs are seldom addressed in the forestry sector. The African Forest Forum (AFF) through the "African Forests, People and Climate Change" Programme funded by the Swiss Agency for International Development (SDC) has contracted NGARA to implement the above studies.

3.11.2 Training Needs Assessment (TNA) report

Table 3.11 summarizes data collated on the training needs among different actors in the selected countries. An analysis of the table reveals that the level of knowledge and skills varied among stakeholders and also in different countries. Collectors have a better knowledge of the trees producing different gums and resins followed by village traders and extension agents. This is understandable especially for collectors and village traders as the trees are among local resources in the communities for which they have better indigenous technical knowledge (ITK). The same applies to extension agents who work closely among the communities, especially those involved with tree based resources. Policy makers had the least knowledge (with Tanzania having the lowest score) probably because of the low level of awareness of the importance of resources and commodities and their contribution to livelihood and economies in the countries, a gap that needs to be addressed if the sector has to be strengthened. Merchants and exporters had moderate to good understanding arising in part from interaction with the collectors and requirements from the markets. Overall the level of knowledge among the stakeholders is ranked as good but there is still a need for training of all stakeholders to improve development of the sector.

As regards knowledge of the type of gums including post-harvest handling practices, exporters had better understanding followed by merchants. This is understandable partly because of the market requirements, which they have to comply with in terms of grading and packaging but also interaction with buyers (importers or processors) who are familiar with the industrial uses. On the other

hand collectors and village traders have moderate knowledge on uses, especially as regards local applications, an aspect that needs to be documented for diversifying applications. However, the low level of knowledge on matters of post-harvest handling among collectors and village traders is noted as a concern because they are important players in enhancing development of the sector, in particular empowerment of women and youth. Overall knowledge and skills across the actors was ranked as moderate thereby a need for training, and more so for actors in the value chain.

Harvesting of gums had only moderate score among all actors with only Niger and Senegal registering good knowledge. This is a serious gap that needs urgent attention because it has a strong bearing on the quantity and quality of the commodity produced. Overall rating was also moderate and hence the need for training. Processing had also a low score, probably because most of the gum is exported in the raw form. It was only in Senegal that a score of good and excellent was recorded among the merchants and exporters/processors where there exists Valdafrique that processes gum to various products.

Generally the following areas were identified among those in need for training under production of gums;

- Identifying the right types of gums and resins producing species
- Non-productivity of some natural gum stands and management of the resources in general
- Types of gums and resins including uses
- Knowledge in harvesting gums and resins including proper harvesting tools and equipment
- Knowledge in post-harvest handling and storage methods
- Knowledge on formation of associations and co-operatives to help improve capacity in production and marketing.
- Clear policies, strategies and incentives on development of gums and resins

On matters of trade and markets exporters had better understanding followed by merchants. The score among exporters was excellent and good among the merchants. This is understandable as it is their core business. Along the value chain collectors had the lowest score while policy makers scored lower among the actors supporting the sector. Overall rating was moderate implying the need for training. Governance issues were the least understood among all actors in the value chain and across countries yet it is an area that is crucial for empowering the communities. Extension agents however, seemed to have a better understanding in Kenya, Niger and Senegal and moderately understood in Tanzania. This aspect needs to be given more attention for empowerment of key actors (women and youth) as well as overall strengthening of the sector (El Nour

et al., 2013). Overall score was moderate implying the need for training. The following areas are among those identified as requiring capacity strengthening in matters of trade and markets as well as governance;

- Low prices at the producer level
- Inadequate data on the resources, trade and marketing
- Low export volumes partly due to inadequate capacity to bulk enough quantities and lack of reliable suppliers partly due to collections from the wild
- Inadequate value addition at the local levels

Policy and legal issues were fairly well understood among the exporters and merchants for actors along the value chain. This is probably because of the various policies and regulations including tax regimes they have to comply with. Policy makers were most familiar with policies and laws notably because they are the ones responsible for formulation and/or implementation. The extension agents were also conversant with policies and regulations since they are among the key implementers in the field. What is lacking is awareness sharing with the players in the value chain. Various studies on these aspects reveal that enabling policies and regulations are necessary for a vibrant gum and resin sector development (Wani et al. 2012; El Siddig and Eltohami, 2018)). Overall rating was moderate to good but requires training.

Finally, Knowledge about Climate variability & change awareness was poor among the players in the value chain but good among those supporting the sector, especially policy makers. Climate variability and change are current topical issues that are impacting negatively on the livelihoods of rural communities and understanding the dynamics will assist local communities undertake appropriate response mechanisms. Some studies carried out in Tanzania have shown that climate change is a major cause of climate related disasters, most of which are from Greenhouse Gas Emissions (GHGs) of which land use change and forestry are the contributing factors (Majule et al. 2014). Advantage should therefore be taken of better understanding among policy makers and extension agents to create awareness among actors in the value as to adapt better to the effects of climate change.

An assessment of the general knowledge of the stakeholders' in gums and resins in the study countries reveals that exporters and merchants have better overall knowledge while collectors and village traders have moderate understanding. Knowledge level is the same among the value chain actors with those in Niger and Senegal having better understanding. The level of involvement in the sector among the exporters and merchants seems to provide them with better exposure on a wide range of issues. It seems that awareness creation about gums in Niger and Senegal has received more attention compared to the other countries.

Among those supporting the sector, it is encouraging that both policy makers and extension agents have a better understanding about the general issues of the sector, an aspect that should make it easier to share knowledge to key actors in the value chain, especially collectors and village traders.

Status of knowledge/ skills / Stakeholder	Species producing gums & resins				Types of gums and resins including uses				Harvesting of gums and resins				Post-harvest handling				Processing of gums and resins				Marketing of gums & resins products				Formation and/or strengthening user groups or coops				policy and Legal issues				Climate change & variability awareness				Rating stakeholder by country			
	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T	S	K	N	T
Collector	3	3	3	3	2	1	1	1	2	1	2	1	1	1	1	2	1	0	0	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	1	1	2	1	2	1
Trader	3	2	2	2	2	1	2	0	2	1	2	1	1	1	1	2	1	0	0	0	2	1	2	1	1	1	1	0	1	0	1	0	1	1	1	1	2	1	2	1
Merchant	2	1	2	2	2	1	2	1	2	1	2	1	3	2	2	2	2	1	2	0	3	2	2	2	1	1	1	0	1	2	2	2	1	1	1	2	2	2	2	2
Exporter/ processor	2	1	2	2	2	2	3	2	2	1	1	1	3	2	2	2	3	2	2	2	3	3	3	3	1	1	1	0	1	2	2	2	1	1	1	2	2	2	2	2
Extension agent	3	2	3	1	2	1	2	0	2	1	2	1	2	1	1	0	2	1	1	0	2	1	1	0	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2	1
Policy maker	1	1	1	0	2	1	1	0	2	1	1	0	2	1	1	0	2	1	1	0	1	0	1	0	2	1	1	0	3	3	3	3	3	3	3	3	2	2	2	1
Overall rating	2	2	2	2	2	1	2	0	2	1	2	1	2	1	1	1	2	1	1	0	2	1	2	1	1	1	1	0	2	1	2	2	2	2	2	2	2	2	2	1

Table 3.11: Training Needs Assessment in Gums and Resins in Senegal, Kenya, Niger and Tanzania

Key: S – Senegal, K – Kenya, N – Niger, T - Tanzania

0 – poor knowledge, 1 – moderate knowledge, 2 – good knowledge, 3 – excellent knowledge

3.11.3 Proposed training curriculum

The TNA has shown that there is improvement in the general knowledge among stakeholders, especially those along the value chain, thanks to the various awareness programmes and trainings since the middle of the last decade. However, there is still need to carry out comprehensive training for all the stakeholders to enhance the level of knowledge in the development of the gums and resins sector in the African Region. A review carried out on the "Regional Training Master Plan" that was prepared by FAO-NGARA for gums and resins in 2005 revealed that the plan is still relevant and only requires updating to include new topics on climate change and governance, among others. Annex 4 is the revised Regional Training Programme. This would complement a traing programme in sustainable management and restoration of gum producing landscapes developed and further updating by FAO under AAD and dryland forestry programmes.

3.12 Support to the organization of expert meetings, consultations /workshops and partners events

NGARA has participated in four workshops organized by FAO-RAF.

The first was the Expert Workshop in Accra (October 16-17, 2019) on "Technical studies of FAO-NGARA collaborative programme in support of "Strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa's Drylands". The CN and agenda were jointly prepared by FAO and NGARA (Annex 5a), which brought together NGARA and FAO experts on EX-ACT Value Chain tool, gender and poverty/vulnerability analysis. The workshop was funded by FAO outside the FAO-NGARA LOA. The following NGARA experts attended the meeting.

Table 3.12: NGARA Experts who attended the Workshop in Accra

Name	Country	Qualification	Email address
Chidume Okoro	Nigeria/Regional/ International Expert/NGARA Chair	BSc in Mechanical Engineering PGD in Project Analysis and Management	gaconlimited@gmail.com
Godwin Kowero	Tanzania/AFF ES/NGARA member	PhD Forest Economics	G.KOWERO@cgiar.org
Mohammed El Mukhtar Ballal	Regional/ International Expert/ NGARA member	PhD in Forest Management	mohamedballal@yahoo.com
Maisharou Abdou	Niger & Sub-regional Coordinator	MSc in Forest Sylviculture and Biology	maisharou.abdou2015@gmail.com
Ben Chikamai	Kenya & NGARA ES	PhD Forest Utilization	bnchikamai@gmail.com

NGARA made several presentations given in annexes (5c-d).

The second workshop was held in Kumasi, Ghana in February 2020, to train National Experts (Lead Enumerators) on field data collection methods, baseline data and value chains analyses. The CN and agenda was prepared by FAO-RAF with inputs from NGARA, FORIG, AFF, PAGGW, and KALRO (annex 5e) and was funded by FAO outside the FAO-NGARA LOA. NGARA experts who attended the workshop are given in Table 3.13. NGARA shared the work plan for the FAO-NGARA component.

Table 3.13: NGARA Experts who attended the Kumasi Workshop

Name	Country	Email Address	Nature of Consultancy
Ahmet HAGGAR	Chad	ahthaggar@yahoo.fr	National
Wubalem Tadesse	Ethiopia	wubalem16@gmail.com	National
Jonas DIARRA	Mali	jonadiarra@yahoo.fr	National
Fred Ojiekpon	Nigeria	ojiekponif@yahoo.com	National
Sakhouda THIAM	Senegal	thiamsak@yahoo.fr	National
Simon Dralley	South Sudan	dralley@gmail.com	National
Patrice ZERBO	Burkina Faso	patzerbo@gmail.com	National
Robinson Ng'ethe	Kenya	robngethe02@yahoo.com	National
Chidume Okoro	Nigeria	gaconlimited@gmail.com	Regional/International
Mohamed M. Ballal	Sudan	mohamedballal@yahoo.com	Regional/International
Maisharou Abdou	Niger	maisharou.abdou2015@gmail.com	Coordinator/Francophone
Ben Chikamai	Kenya	bnchikamai@gmail.com	Regional Coordinator

Following the Kumasi workshop, organizations dealing with value chains (AFF, NGARA and KALRO) met at AFF Secretariat to elaborate and harmonize various tools. The information generated was shared with FORIG which is coordinating germplasm aspects of the value chain for further inputs, if any. The final versions of what ????? are given as annexes 5f – 5i.

The third event relates to the Twenty Second Session of the African Forestry and Wildlife Commission and was organized as a contribution of NGARA under this LOA to the Sixth African Forestry and Wildlife Week (AFWC22/AFWW6) held at Skukuza, Mpumalanga, South Africa from 9 to 13

March 2020. NGARA has led the organization of the event and supported the participation of Six Heads of Forest Institutions as well as 5 other participants from the NGARA Secretariat and oter countrues using resources of the LOA. Two participants from Madagascar and Tunisia canceled their trip for various reasons after bookings had been made while a participant from Tanzania was directly supported from FAO-RAF. Details of participants supported through the FAO-NGARA LOA are given in Table 3.14.

Table 3.14: List of participants supported by NGARA through FAO-NGARA LOA

Name	Country	Position	Email Address
Chilima, Clement	Malawi	Forestry Advisor Ministry of Natural Resources, Energy and Mining	cchilima@gmail.com
Tezoo, Vishnu	Mauritius	Conservator of Forests Forestry Service	vtezoo@govmu.org
Mangwanya, Fulton Upenyu	Zimbabwe	Director General Zimbabwe Parks and Wildlife Management Authority	upfusnr@gmail.com
Chikamai, Ben	Kenya	Executive Secretary The Network for Natural Gums and Resins in Africa (NGARA)	bnchikamai@gmail.com
Wanjiru Kori, Esther	Kenya	Accountant/Administrator The Network for Natural Gums and Resins in Africa (NGARA)	esskori@yahoo.com

As part of this contribution and attendance covered by the LOA, NGARA organized jointly with AFF a side event on Sustainable Business Models for Tree-based value chains in sub-Saharan Africa: charcoal, gum and resins that was held on March 10, 2020 between 12:00-13:30 in the main hall. The CN for the event is given as annex 5j. NGARA made a PPT presentation focusing on “Gums and Resins: Contribution to Socio-Economic Well Being and Ecological Resilience in the African Drylands” (annex 5k). The session was moderated by Godwin Kowero and panelists comprised: Jeremie Mbairamadji - Forestry Officer, FAO; Abubaker Yousif Abdalla - Director, Forests National Corporation, North Darfur State, Sudan and Victor Chiiba - Provincial Forestry Officer, Zambia. Each of the panelists made brief presentations on the topics, which for gums and resins highlighted need for enabling policy, legal and institutional frameworks that provide clear and timely incentives to support the development of the sector, recognized the role of women in the gums and resins sector but noted that there are constrains they experience in accessing appropriate harvesting tools which has implications for the sustainability of the resource they depend on, also there is need for collectors to be trained in all aspects of good practices of harvesting and post-harvest handling. To this end capacity building is necessary. The event was also informed that there is a new project developed by FAO for GCF funding in Sudan, called GAMS (Gum arabic for adaptation and mitigation in Sudan) contributing also to the GGW Initiative, in addition to the

multi-country project under development by FAO on scaling up resilience of the Great Green Wall (SURAGGWA) benefiting 6 other countries. GAMS project has been recently approved by the GCF and focuses on upgrading of the gum arabic value chain, which offers opportunity to improve production of gum arabic in the country and a valuable contributind lessons learnt to the SURAGGWA project development also to be submitted to GCF funding. The report of the event is also included in the AFWC22/AFWW6 report available on AFWC wbesite[1]

The fourth and last workshop was the **Validation Regional Virtual Workshop on Sustainable and Resilient Value Chains for Gum Arabic and other NTFPs for SURAGGWA held on December 16, 2020.** The workshop was part of the activity in the LOA on the organization of workshop for partners' engagement and resource mobilization for the Gum arabic programme. The CN and agenda are given as annex 5l while the workshop report is presented as annex 5m.

3.13 Raising the profile of NGARA

In an effort to raise the profile of NGARA, a Knowledge Management Expert was recruited to undertake the following tasks, among others;

i. Develop framework to update and improve visibility of NGARA Website – www.ngara.org,
ii. Develop and maintain database (s), and
iii. Disseminate NGARA Knowledge Products

So far a redesigned NGARA website has been developed and formally launched. The redesigned website has a user-friendly, highly interactive platform that enhances engagement and aggregating information according to respective interests as per country to encourage knowledge exchange. The current website is more dynamic, interactive, user-friendly and easy-to-update. Additionally, the NGARA website has;

- ❖ a robust digital repository that stores and maintains digital information for NGARA countries members for access and reuse and uploading,
- ❖ updated database of NGARA Project Consultants and is populated with relevant documents
- ❖ an updated visual design that is professional, fresh, and modern current to minimize number of click-through to get information

The NGARA website can be accessed at www.ngara.org

[1] http://www.fao.org/3/ca9317en/ca9317en.pdf

4.0 Challenges and actions undertaken

The FAO-NGARA Programme is a valuable partnership in the development of the forestry sector on the African continent, a partnership that was strengthened following registration of NGARA as Pan African Non-Governmental Organization (NGO) in 2018 and development of the NGARA Strategy: Overview and Framework of Priorities 2017-2030. NGARA is currently implementing two project studies for FAO in nine NGARA member countries through a LOA signed in September 2019.

Two challenges were experienced in the course of implementation. One challenge faced in the implementation is that six of the beneficiary countries are implementing the two projects, which however, have slightly different deliverables. This challenge was however, resolved by harmonizing the methodologies to ensure that various tasks are reported appropriately. Countries implementing the SURAGGWA formulation project had to go an extra mile to report on the tasks that will generate the required data and information in the formulation of the SURAGGWA project. The second challenge relates to the COVID-19 Pandemic which led to lock-downs in all the countries thereby affecting movement of experts to various sites for gathering information. The challenge slowed the progress but the situation but this was overcome getting an extension of the project period to December 31, 2020. Therefore, the workshop held in December was organized virtually ionstead of being a face-to-face workshop.

5.0 Conclusion and Recommendations

5.1 Conclusion

A review of literature and field appraisals has revealed that the main sources of gum Arabic of commerce in Africa are *Senegalia (Acacia) senegal* and *Vachellia (Acacia) seyal*. However, there exist other commercial gums that are marketed as gum Arabic in some countries, which include *Senegalia laeta and Senegalia dudgeon* in West Africa and *Senegalia polycantha* in Eastern Africa. These species are closely related to *Senegalia senegal* in the sub-genus *vulgares.* As regards occurrence and resource distribution, there is variation in the general trend among countries in the Sahel and around the equator. There were clear shifts in the gum arabic production southwards among countries in the Sahel as shown by the isohyets but different scenarios in the countries near the equator, which showed shrinkage in the areas producing gum arabic. However, the driving factors were the same; climate change and anthropogenic factors

Analysis of the gum samples received revealed all the samples supplied from *S. senegal* and *V. seyal* conformed to the standard specification indicating that there was no adulteration as was observed previously, thanks to the awareness that has been made in the producer countries over the last few years.

Analysis of stakeholders in the gum arabic sector identified two main categories; actors along the value chain and those providing support to the sector. The former comprises of the collectors, merchants, exporters and processors while the latter category includes the government, development partners and non-governmental organizations. Women and youth (boys and girls) and the main players in the harvesting and post-harvest handling activities but generally lack suitable knowledge and tools for enhanced quality and quantity production. Men are more involved as merchants both at local and national levels. A further analysis of benefit sharing arrangement showed that though there was variation in the costs incurred by collectors in different countries they generally obtain a good return on their investment with profit margins ranging between 46% in Tanzania to 55% in Niger. However, profit margins for wholesalers were the least and ranged from -7% in Tanzania to 15% in Niger, largely affected by heavy government taxes, which eat into the profits.

Most of the gum arabic from producer countries is exported in the raw form, which denies actors and governments from reaping maximum benefits. Only a few countries have industries for processing the gum to its final form for further application.

Results of the TNA revealed that the level of knowledge and skills varied among stakeholders and also in different countries. Collectors, extension agents and village traders had better knowledge of the resources but low level of understanding regarding harvesting and post-harvest handling, which are serious gaps for ensuring good quality and quantity produced and sustainability of the resource. Merchants including exporters had better knowledge about the uses, especially commercial, trade and marketing of the gums, which is understandable as it is their core business. Policy makers and Extension agents were more knowledgeable on matters policies and laws notably because they are the ones responsible for formulation and implementation respectively. However, there was need for training at all levels and increased awareness creation for greater impact and proper development of the sector. Areas for skills and knowledge enhancement have been developed in arevised training master plan.

On matters of policies and regulations, it was observed that this is an area which has not been properly addressed for the gums sector compared to other agricultural and related natural resource sectors. An evaluation of the existing policies reveal that there are no policies that explicitly address the gums sector though there exist various policies that indirectly cover forest resources/commodities that are relevant to the gums sector.

There exist several institutions in producer countries involved in the gum arabic sector but there is lack of proper coordination and documentation, which has hampered proper development of the sector. The absence of clear policies and laws/regulations for the sector have partly contributed to the situation while in other circumstances the relevant institutions are scattered in different sectors and ministries to enable proper coordination.

5.2 Recommendations

The following recommendations are proposed to be integraeted as part of the SURAGGWA project under development benefiting the six countries and other projects to be developed further for other countries:

i. There is need to develop programmes in producer countries for sustainable management and restoration of degraded areas with identified gums producing species to ensure long term sustainability in the production of the commodities and livelihoods.

ii. The area of capacity development was identified as a major gap affecting the countries in producing the commodities to measure to the potential identified as well as ensure good quality of the commodities. Capacity development will address many aspects including enhancing capacities of key players along the value chain, especially women and youth, as well as governments supporting the sector, streamlining the value chains, and enhancing value addition in processing, among others. In this respect, the draft “Regional Training Master Plan” need to be finalized and to be used for training of target audience at country and regional levels. This an area where NGARA has capacity and can play an important role of developing the gum arabic and allied commodities in the beneficiary countries and at regional level.

iii. There is need to explore further development of processing capacity of gum arabic in selected countries for value addition to enhance accrued benefits to the producers. To do so, there is a need to develop public-private partnership. NGARA has strong linkages with private sector players at the national levels of several member countries and also with key international

organizations like AIPG and AIDGUM, which can be harnessed to promote investments in producer countries. Institutional strengthening focusing on national associations with stronger private sector participation will be an important activity.

iv. Governments should be encouraged to develop policies and laws relevant the gum arabic sector to create enabling environment for the development of the sector. NGARA in collaboration with AFF, FAO can work with member countries to develop national and regional policies/regulations, policies on tax regimes in production, processing and trade and also on policies on transboundary conflict resolution.

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Annexes

Annex 1: Sites for implementation of FAO-NGARA studies

Country	State/Region	Area/Site	Communes	Population
Burkina Faso	Centre-North	Bam	Bourzanga, Guibaré, Nasséré, Rollo, Rouko, Sabcé, Tikaré, Zimtanga.	277 092
		Namentenga	Boala, Bouroum, Dargo, Nagbingou, Tougouri, Yalgo, Zéguédéguin	252 738
		Sanmatenga	Barsalogho, Boussouma, Dablo, Korsimoro, Mané, Namissiguima, Pensa, Pibaoré, Pissila, Ziga.	464 032
	East	Gnagna	Bilanga, Coalla, Liptougou, Manni, Piéla, Thion.	407 739
		Gourma	Diabo, Diapangou, Matiacoali, Tibga, Yamba	304 169
		Komandjaria	Bartiébougou, Foutouri	80 047
		Kompienga	Kompienga, Madjoari,	75 662
		Tapoa	Botou, Kantchari, Logobou, Namounou, Partiaga, Tambaga, Tansarga	341 782
	North	Yatenga	Barga, Kaïn, Kalsaka, Kossouka, Koumbri, Namissiguima, Oula, Rambo, Séguénéga, Tangaye, Thiou, Zogoré	547 952
		Lorum	Banh, Ouindigui, Sollé	142 853
		Passoré	Arbollé, Bagaré, Bokin, Gomponsom, Kirsi, Lâ-Todin, Pilimpikou, Samba	322 873
		Zondoma	Bassi, Boussou, Léba, Tougo.	168 955
	Plateau central	Oubritenga	Absouya, Dapélogo, Loumbila, Nagréongo, Ourgou-Manéga, Zitenga	197 237

		Ganzourgou	Boudry, Kogho, Méguet, Mogtédo, Salogo, Zam, Zoungou	807 444
		Kourwéogo	Laye, Niou, Sourgoubila, Toéghin	154 611
	Sahel	Séno	Bani, Falangountou, Gorgadji, Sampelga, Seytenga	264 815
		Oudalan	Déou, Markoye, Oursi, Tin-Akoff.	197 240
		Soum	Arbinda, Baraboulé, Djiguel, Kelbo, Koutougou, Nassoumbou, Pobé-Mengao, Tongomayel	348 341
		Yagha	Boundoré, Mansila, Solhan, Tankougounadié, Titabé	159 485
Chad	Hajer Lamis	Dababa	Bokoro	219686
	Batha	Fitri	Yao	116157
	Ouddaï	Assoungha	Adré	282315
	Bahr ElGhazal	Bahr ElGhazal Sud	Chedra	
	Lac	Wayii	Ngouri	219127
		Doum doum	Doum doum	
	Wadi Fira	Iriba	Iriba	
		Dartama	Guereda	179095
Ethiopia	Southern Ethiopia (Borena Lowlands)	Yabello		
	North Western Ethiopia	Humera		
Kenya	Wajir	Wajir North		62,206
		Wajir East		110,654
		Wajir South		116,814

		Wajir West		121,828
	Isiolo	Isiolo Central		121,066
		Garbatula		99,730
	Marsabit	Laisamis		65,376
		LoiyangalanI		35,713
		North Horr		54,297
		Moyale		108,949
	Turkana	Turkana North		65,218
		Turkana West		239,627
		Loima		107,795
		Turkana South		153,736
		Turkana East		138,526
Niger	Agadez	Departement De Iferouane	Commune De : Iferouane	13 655
			Commune De : Timia	19 076
		Departement De : Ingall	Commune De : Ingall	51 903
		Departemen De Tchirozerine	Commune De Tchirozerine	63 503
			Commune De : Agadez	118 240
			Commune De : Dabaga	23 969
			Commune De : Tabelot	38 994
Niger	Diffa	Departement De : Bosso	Commune De : Bosso	65 022
		Departement De :	Commune De : Chetimari	65 449

		Diffa	COMMUNE DE : DIFFA	56 437
			COMMUNE DE : GUESKEROU	37 836
		Departement De Maine Soroa	Commune De : Foulatari	30 953
			COMMUNE DE : MAINE SOROA	78 735
			COMMUNE DE : N'GUELBELY	21 976
		Departement De Goudoumaria	Commune De Goudoumaria	100 559
Niger	Tahoua	Departement De Abalak	Commune De : Abalak	74 719
		Departement De Bagaroua	Commune De Bagaroua	72 293
		Departement Konni	Commune De Allela	52 196
			Commune De Bazaga	37 571
			Commune De Konni	149 414
			Commune Tsernaoua	73 705
		Departement De Bouza	Commune De Allakaye	80 280
			Commune De Babankatami	65 906
			Commune De Bouza	101 445
			Commune De Deoule	21 009
			Commune De Korofane	77 796
			Commune De Tabotaki	46 266

			Commune De Tama	52 661
		Departement De Illela	Commune De Badaguichiri	115 491
			Commune De Illela	142 214
			Commune De Tajae	78 080
		Departement Keita	Garhanga	69 712
			Commune De Ibohamane	88 724
			Commune De Keita	67 304
			Commune De Tamaske	111 358
		Departement Tchintabaraden	Commune De Kao	65 197
			Commune De Tchintabaraden	79 889
		Departement De Tillia	Commune De Tillia	38 994
		Ville De Tahoua	Tahoua Arrondissement I	18 277
			Tahoua Arrondissement Ii	95 929
Niger	Dosso	Departement De : Boboye	Commune De Birnin Gaoure	52 566
			Commune De : Fabidji	39 713
			Commune De : Fakara	19 077
			Commune De :	23 567
			Harikanassou	

			Commune De : Kankandi	16 565
			Commune De : Kiota	25 282
			Commune De : Koygolo	48 218
			Commune De : N'gonga	27 609
		Departement De Zabori	Commune De Dioundiou	54 157
			Commune De Karakara	44 333
			Commune De Zabori	11 125
		Departement De Dogondoutchi	Commune De Dankassari	78 132
			Commune De Dogon Kiria	65 990
			Commune De Kieche	48 980
			Commune De Matankari	68 979
			Commune De Soucoucoutane	38 700
		Departement De Falmey	Commune De Falmey/Falmey Haoussa	75 115
			Commune De Guilladje	28 156
		Departement De Loga	Communed Efalwel	57 564
			Commune De Loga	82 400
			Commune De Sakorbe	35 579

Niger	Zinder	Departemntt De Belbegi	Commune De Tarka	96 452
		Departement De Damagaram Takaya	Commune De Albarkaram	17 619
			Commune De Damagaram Takaya	61 580
			Commune De Gudimouni	69 587
			Commune De Mazamni	22 183
			Commune De Moa	26 632
			Commune De Wame	43 568
		Departement De Dungass	Commune De Dogo-Dogo	65 544
			Commune De Dungass	127 757
			Commune De Gouchi	71 612
			Commune De Malawa	88 954
		Departement De Magaria	Commune De Bande	114 242
			Commune De Dantchiao	71 018
			Commune De Kwaya	32 510
			Commune De Magaria	130 707
			Commune De Sassoumbroum	78 163
			Commune De Wacha	93 492
			Commune De Yekoua	57 611
		Departement De Mirriah	Commune De Dogo	113 447
			Commune De Droum	102 306
			Commune De Gaffati	46 379

			Commune De Gouna	63 598
			Commune De Hamdara	39 574
			Commune De Kolleram	29 583
			Commune De Mirriah	80 126
			Commune De Zermou	32 486
Niger	Maradi	Departement De Aguie	Commune De Aguie	152 788
			Commmune De Tchadoua	93 208
		Departement De Bermo	Commune De Bermo	30 761
			Commune De Gadabedji	21 513
			Commune De Ajekoria	79 108
			Commune De Azagor	5 565
			Commune De Birni Lalle	30 846
			Commune De Dakoro	71 201
			Commune De Dan Goulbi	57 228
			Commune De Korahane	12 577
			Commune De Kornaka	140 009
			Commune De Mayara	62 441
			Commune De Roumbou I	13 330
			Commune De Sabon Machi	35 988

			Commune De Tagriss	53 925
		Departement De Gazaoua	Commune De Gangara	51 930
			Commune De Gazaoua	108 606
		Departement De Guidan Roumdji	Communde Chadakori	108 711
			Commune De Guidan Roumdji	95 791
			Commune De Guidan Sori	93 771
			Commune De Sae Saboua	99 638
			Commune De Tibiri	125 806
		Departement De Madarounfa	Commune De Dan Issa	94 841
			Commune De Giratawa	85 976
			Commune De Gabi	83 203
			Commune De Madarounfa	71 832
			Commune De Safo	76 454
			Commune De Sarkin Yamma	36 557
			Commune De Tchake	40 502
		Depatement De Tessaoua	Commune De Baoudetta	11 867
			Commune De Hawandawaki	39 739
			Commune De Koona	14 888
			Commune De Korgom	68 057

			Commune De Majirgui	70 655
			Commune De Ourafane	137 850
			Commune De Tessaou	172 796
Niger	Tillaberi	Departement De Abala	Commune De Abala	144 287
			Commune De Sanam	68 466
		Departement De Ayerou	Commune De Ayerou	33 527
			Commune De Inates	23 503
		Departement De Balleyara	Commune De Tagzar	107 134
		Deparetement De Filingue	Commune De Filingue	92 097
			Commune De Imanan	38 783
			Commune De Kourfeye	66 855
			Commune De Tondikandia	108 991
		Departement De Gotheye	Commune De Dargol	147 779
			Commune De Gotheye	93 264
		Departement De Kollo	Commune De Bitinkodji	29 067
			Commune De Dantchandou	37 059
			Commune De Hamdallllaye	57 002

			Commune De Karma	88 224
		Departement De Ouallam	Commune De Dingazi	44 486
			Commune De Ouallam	68 191
			Commune De Simiri	103 057
			Commune De Tondikiwindi	111 490
		Departement De Say	Commune De Ouro	27 553
			Commune De Say	58 290
			Commune De Tamou	89 782
		Departement De Tera	Commune De Diagourou	61 472
			Commune De Gorouol	66 276
			Commune De Kokorou	96 218
			Commune De Mehana	40 593
			Commune De Tera	71 648
Nigeria	Sokoto	*Illela		150489.00
		Wurno		162307.00
	Jigawa	*Sule-Tankarkar		130849.00
		Kaugama		128981.00
		Birni Kudu		314108.00
		Kirikasanma		192583.00
	Bauchi	*Gamawa		288638.00
		Alkaleri		329424.00
		Kirfi		147618.00
	Yobe	Damaturu		87706.00

	Bursari		109692.00
	Yusufari		125040.00
	Karasuwa		105514.00
	Yunusari		125940.00
Borno	Mafa		103600.00
	Dikwa		105042.00
	Konduga		157322.00
	Magumeri		140257.00
	Gubio		151286.00
	Nganzai		99074.00
	Kaga		89996.00
Katsina	Zango		210600.00
	Mashi		230900.00
	Maiaduwa		272400.00
	Kaita		246200.00
Gombe	Dukku		207658.00
	FunaKaye		237687.00
	Kwami		193995.00
	Nafada		140185.00
	Akko		337435.00
Adamawa	Hong		169183.00
	Girei		129855.00
	Yola South		197197.00
Kano	Gabasawa		211204.00
	Dambata		210474.00

		Ajingi		172610.00
		Makoda		220094.00
	Zamfara	Shinkafi		135964.00
		Talata Mafara		215650.00
	Taraba	Gashaka		87166.00
		Wukari		238283.00
		Zing		167285.00
Senegal	Région	Departement	Communes	
	Kédougou	Kédougou	*Bandafassi*	
		Salémata		
		Saraya		
	Louga	Louga	Syer	
		Linguère	Mboula	
			Tessekere Forage	
			Koily Alpha	
		Kébémer		
	Matam	Matam	*Ogo*	
		Ranerou	*Oudallaye*	
		Kanel	*Ouro sidy*	
	Saint-Louis	Dagana		
		Saint-Louis		
		Podor	*Boké Dialoubé*	
	Tambacounda	Bakel	*Gabou*	
		Goudiry		
		Tambacounda		
		Koupentoum		

		Goudiry		
		Tambacounda		
		Koupentoum		
South Sudan	Upper Nile State (UNS)	Renk	Jalhak	
		Wadakona	Wadakona	
	Eastern Equatoria State (EES)	Kapoeta	Kopoeta North	

Annexes 2 - 5 have been submitted as separate files because of the size of the attached documents. They include the following;

- Annex 2a - 2e: TORs of Experts for the FAO-NGARA Studies
- Annex 3a - 3i: Country specific reports
- Annex 4: Draft Revised Regional Training Programme
- Annex 5a - 5k: Documents for Various Workshops
  - 5a :Concept Note and agenda for the FAO and NGARA Accra Workshop
  - 5b - d: NGARA presentations at the Accra workshop on Knowledge products, strengthening the Gum Arabic Sector for Sustainable and Resilient Landscapes & Livelihoods of Women and Youth in Africa's Drylands and state of knowledge/information on the gum arabic sector in africa
  - 5e: CN and agenda for the SURAGGWA Workshop held in Kumasi
  - 5f-5i: Tools for data collection for collectors, traders, exporters and processors
  - 5j: CN for the side event on Sustainable Business Models for Tree-based value chains in sub-Saharan Africa: charcoal and gums and resins
  - 5k: PPT Presentation on Gums and Resins: Contribution to Socio-Economic Well Being and Ecological Resilience in the African Drylands
  - 5l: CN and agenda for the Validation Regional Virtual Workshop on SURAGGWA Sustainable and Resilient Value Chains for Gum Arabic and other NTFPs
  - 5m: Workshop report on SURAGGWA - Sustainable and Resilient Value Chains for Gum Arabic and other NTFPs