Food and Agriculture Organization of the United Nations

NGARA

# Strengthening the Gum Arabic Sub Sector for Sustainable and Resilient Landscapes and Livelihoods of Women and Youth in Africa's Drylands in Nigeria


**By**

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**The Network for Natural Gums and Resins in Africa**

**OCTOBER, 2020**

## List of Abbreviations and Acronyms

| | |
|---|---|
| AAD | Action Against Desertification |
| ACP | Caribbean and Pacific Group of States |
| AfDB | Africa Development Bank |
| AFF | Africa Forest Forum |
| AUC | Africa Union Congress |
| CBN | Central Bank of Nigeria |
| CBOs | Community based Organisations |
| CD ROM | Compact Disc Read-Only Memory |
| COVID-19 | Corona Virus Disease 2019 |
| DFPC | Dansa Food Processing Company Kano Nigeria |
| EU- ACP Action | European Union - Caribbean and Pacific Group of States |
| EX-ACT Tool | Ex-Ante Carbon Balance Tool |
| EX-ACT VC Tool | Ex-Ante Carbon Balance Value Chain Tool |
| FAO | Food and Agricultural Organization of United Nation |
| FCT | Federal Capital Territory (Abuja) |
| FDA | Federal Department of Agriculture |
| FMARD | Federal Ministry of Agriculture and Rural Development |
| FME | Federal Ministry of Environment |
| FMITI | Federal Ministry of Industries, Trade and Investment |
| FORIG | Forestry Research Institute of Ghana |
| FOS | Federal Office of Statistics |
| FRIN | Forestry Research Institute of Nigeria |
| GCF | Green Climate Fund |
| GGW | Great Green Wall |
| IFAD | International Fund For Agricultural Development |
| ITC | International Trade Centre Geneva |
| KALRO | Kenya Agricultural and Livestock Research Organization |
| LGA | Local Government Area |
| MT | Metric Tone |
| MTN | Mobile Telephone Netwo33rk |
| NABDA | National Biotechnology Development |
| NAERLS | Nigeria Agricultural Research Extension and Liaison Services |
| NAFDAC | National Food Drug Administration and Control |
| NAGGW | National Agency for Great Green Wall |
| NAGAPPEN | National Association of Gum Arabic Producers, Processors and Exporters of Nigeria |
| NAICPP | National Accelerated Industrial Crops Production Progrmme |
| NAPAs | National Adaptation Programme of Actions |
| NCS | Nigeria Custom Services |
| NGARA | Network for Natural Gums and Resins in Africa |
| NGGW | National Great Green Wall |
| NGOs | Non Governmental Organization |
| NSCN | National Shippers Council of Nigeria |

| | |
|---|---|
| NTFP | Non-Timber Forest Product |
| PAGGW | Pan African Agency for Great Green Wall |
| PB Tool | Planning and Budgeting Tool |
| PSC | Project Steering Committee |
| RAF | Regional Office For Africa (FAO) |
| RMRDC | Raw Materials Research and Development Council |
| RRIN | Rubber Research Institute of Nigeria |
| SON | Standard organization of Nigeria |
| SURAGGWA | Scaling up Resilience in Africa's Great Green Wall |
| SWOT | Strength, Weakness, Opportunity and Threats |
| TIC | Technical Implementation Committee |
| TNA | Training Needs Assessment |
| UNCTAD | United Nation Centre For Trade and Development |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USAID | United States Agency for International Development |
| USD | United States Dollar |

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**Executive Summary**

The project "Strengthening the gum arabic sector for sustainable and resilient landscapes and livelihoods of women and youth in Africa's drylands was supported by FAO under the framework of NGARA. It was a regional project implemented in six Africa countries namely Ethiopia, Nigeria, South Sudan, Niger, Senegal and Mali. To begin implementation of the project FAO/NGARA recruited one consultant per benefiting country to generate information on status of gum arabic production, market and trade; analysis of status of the resources and agro-ecological shifts in the resource producing areas; identify key actors along the value chain and the benefit sharing arrangement; conduct gender, poverty and vulnerability studies and recommendation of strategies for empowerment particularly youth and women; current capacity in terms of market and value addition; review status of institutional frameworks and develop strategies for strengthening; conduct training needs assessment to identity training needs; review national policy frameworks and legislation and to develop appropriate policy proposals and legal frame works. The information generated was used to formulate investment proposals for intervention in the sector. The next step in the implementation process was organization of project inception workshop which took place at the Forestry Research Institute of Ghana in Kumasi from 10 – 14th February, 2020. Experts/consultants from implementing countries, FAO, NGARA group and GCF programming team were in attendance. Others were FORIG/ KALRO, AFF and PAGGW teams. Out of the 64 workshop participants twelve were members of NGARA group.

To elicit required information literature review of research publications, workshop manuals, proceedings, monographs of gum arabic resource, reviews of information from the ministries of agriculture, environment and specialized agencies such as RRIN, NAERLS, RMRDC, NAGAPPEN and NGOs, technical expert group meetings, bibliographic review, field rapid rural appraisal interviews and smart phone survey were used to generate information on existing gum arabic resource maps; agro-ecological shifts due to climate change and variability; existing programmes/projects/activities of key actors involved in the management of gum arabic resource, production, processing, trade and investment opportunities as well as status of land use changes occurring in Sahel and Savanna regions where gum arabic is found. In addition, questionnaires and EX-ACT VC analysis were used to collect data from women/youth/disadvantaged groups along the value chain in selected communities in gum arabic producing states. Nigeria current capacity in terms of market and value addition with highlight of her strength, weaknesses, opportunities and threats was achieved with small brainstorming group among subject matter specialists. During interviews and focused group discussions at community levels questions on local by-laws with respect to gum arabic were asked and result used to develop policy change that will up-scale women and youth economic empowerment and equitable benefit sharing along the resource value chain. Training needs assessment was carried out and result used to identify training needs and development of training curriculum.

Results showed that gum arabic is found in the Sudan and Sahelian savannas approximately 249,070 $km^2$ out of 923,763 $km^2$ total land mass of Nigeria. Wild and cultivated forms of gum

arabic are found in thirteen states of northern Nigeria namely: Kebbi, Sokoto, Zamfara, Katsina, Kano, Jigawa, Borno, Yobe, Bauchi, Gombe, Adamawa, Taraba and Plateau. However, over 70% of grades 1 and 2 gum arabic are predominantly found in Borno, Yobe and Jigawa states. Three commercial grades of gum arabic are found in Nigeria based on botanical source they are: grade 1 produced by *Acacia senegal*, grade 2 produced by Acacia seyal and grade 3 produced by Acacia polycantha, Combretum nigricans and other species of Acacias that do not qualify as grade 1 and 2. Three varieties of *Acacia senegal* have been identified in Nigeria namely *Acacia senegal* variety *senegal*, *Acacia senegal* variety *leiorhachis* and *Acacia senegal* variety *kerensis* as well as two varieties of Acacia seyal viz: *Acacia seyal* variety *seyal* and *Acacia seyal* variety *fistula*.

Over 75% of Nigeria gum arabic is obtained from wild collections. Many government owned plantations are not being exploited because the plantations were established principally for desertification control projects hence, gum arabic production in Nigeria is restricted to wild collections and harvesting/tapping from few plantations. Gum yield is low 0.2-0.3 tons/Ha. Owing to ecological shift and insecurity a considerable number of trees including gum arabic occurred outside forests, mostly (80.9%) in croplands. Nigeria gum arabic output was 17,626 tons and 19,467 tons in 2005 and 2010, respectively but dropped drastically to about 5,854 tons in 2015 owing to insecurity occasioned by 'Boko Haram', herdsmen attacks, cattle rustling, kidnapping and armed banditry in the major gum arabic producing communities and states. With renewed zeal of federal government of Nigeria in collaboration with Multi-National Joint Task Force to completely decimate 'Boko Haram', herdsmen and bandits, the groups have been weakened thereby reducing their activities drastically. They only carry out occasional attacks in the fringes of particularly Borno and Yobe States. Normalcy has gradually returned to many of the hitherto affected communities with many of the internally displaced persons gradually returning home as government, NGOs and public spirited individuals try to rebuild the communities. Businesses, agriculture and marketing activities have rebound in many of the communities with gum production going up to 12,000 tons in 2020.

In Nigeria several MDAs (FMARD, FME, FMITI, CBN, FO, GGW, RMRDC, NAFDAC, SON, NCS, FRIN, FDA, NAERLS) and some international organisations (FAO, NGARA, AAD, IFAD) are involved in gum arabic value chain activities each one carrying out its specific roles. There is a dedicated research institution (Gum Arabic Research Sub Station of Rubber Research Institute of Nigeria) established and mandated by federal government to conducting research and development activities in gum arabic value chain. The institution conducts research into breeding and agronomic improvement of the species, production and distribution of large quantities of certified gum arabic planting materials annually, processing, storage, product development, training etc.

Gum arabic trade in Nigeria has a well structured market with different actors. At the village levels are the local buying agents. They receive money from wholesalers based in urban centres. The agents buy the gum from local producers, gum collectors or migrant collectors especially on market days. They take out their commissions then send the gum to their principals. They also sell to the traders/wholesalers who in turn sell to exporters. At the warehouses of the wholesalers or exporters some kind of value adding activities such as cleaning, sorting and grading of the gum are being undertaken. After cleaning the gum is bagged and loaded into containers and sent to Tin

Can or Apapa Port in Lagos for export. Only one company (Dansa Food Processing Company) based in Kano Nigeria that is processing spray dried and kibbled gum arabic with an installed capacity of 15tons of gum arabic/day.

Over 90% of gum arabic produced in Nigeria is exported. Apart from the conventional application of gum arabic in foods and beverages, confectioneries, pharmaceuticals, bakery products, cosmetics, it is used locally as ink, adhesives, craft making, stiffening of clothes and male caps after washing. Traditionally, gum arabic is believed to cure cough, diarrhea, dysentery, hemorrhage, treatment of skin disease and inflammations in animals, sore throats, cold, back and joint pains, kidney pains, eye diseases.

In Nigeria, women and youth are the ones mostly involved in harvesting/collection of gum arabic from the wild/plantations, carrying out of nursery activities, drying, cleaning, sorting, grading of gum to ensure that their gum meet international standards unfortunately, women and youth are the least remunerated along gum arabic value chain. Women and youth groups, cooperatives etc are rear features at the community and village levels. However, NAGAPPEN is one commodity association with over 1,000 members per state and has penetrated the communities and well embraced by gum arabic farmers, traders, youth and women. Formal laws, rules, regulations, organizations, customs, norms, and informal conventions that bother on gum arabic institutional frameworks are in place in Nigeria. However, it will be necessary to build on it and strengthen existing institutional frameworks with better considerations for female gender, private sector and civil society participation.

In conclusion to make gum arabic sector a lucrative and attractive business in Nigeria, where it has potential to promote economic development through higher incomes; improve livelihoods and economic empower of especially women, youth and the disadvantaged groups FAO and NGARA should work out to fund for implementation of key recommendations contained in this report.

## 1.0 Introduction

1.1 Background to the Study

Gum arabic is the dried exudate obtained from stems and branches of *Acacia senegal or Acacia seyal* mostly found in arid and semi-arid lands of Africa (Anon, 1985; FAO, 1997; Dorthe, 2000). In Nigeria, it is found in North Western states of Kebbi, Sokoto, Zamfara, Katsina, Kano and Jigawa while in North East it is found in Yobe, Borno, Gombe, Bauchi, Adamawa and Taraba states. Pockets of it could be found in Plateau and Niger states especially in areas from latitude $10^{o}$ 30'N to $12^{o}$ 00'N (Ojiekpon and Aghughu, 1997). These renewable resources are important sources of rural income and foreign exchange for the producing countries. In addition, it promotes sustainable agriculture and forestry, ensure food security and combats desertification and climate change. It has the potential of playing a critical role in producer countries' efforts to achieve the Sustainable Development Goals. It provides opportunities for trade, employment and improvement in the livelihoods of particularly women and youth mostly involved in gum collection and other value chain activities. It plays key roles in conservation of biological diversities and ecosystem functions while increasing overall productivity of the land. The current annual world demand for gum arabic is about 150,000 MT against a supply of about 80,000 MT which is projected to reach 150,000 MT by 2020 (Okoro and Muller, 2004). Sudan leads the world production and export of gum arabic producing about 47% of the commodity traded annually followed by Nigeria and Chad that produce about 28% and 20%, respectively (ITC, 2010).

1.2 Opportunities and Challenges to the Development of Gum Arabic Sector in Nigeria:

However, livelihoods in the rural and pastoral communities where these natural resources are produced are increasingly endangered by deforestation, repeated drought, food insecurity, insufficient and erratic rainfall resulting in the depletion of water bodies, shifting cultivation, forest clearing, migration of people and rural pastoralists exacerbated by desertification and climate change actions. This land degradation menace often times results in farmers and herdsmen conflicts as well as social insecurities in the communities and place. Several people have been killed by pastoralists in these regions as they move southwards with their cattle in search of food and water. Other challenges facing gum arabic sector in Nigeria include: low value addition, export orientation, gender segmentation and inequitable benefits sharing among stakeholders along the gum arabic value chain, low production and marketing skills, insufficient market information, inadequate infrastructures and financial services, weak research capacities, poor knowledge sharing from country experiences, limited direct access to international markets, inadequate policies and un-favourable business environment. Despite huge economic benefits accruable from gum arabic production and trade, bulk of the gum arabic is obtained from the wild deploying inadequate tools and skills. In the end most of the gum is exported as crude to Europe and Asia at low foreign exchange unlike semi processed and processed gum arabic exported from import countries. Also, women and youth play vital roles in harvesting gum arabic from the wild/plantations; carrying out gum arabic seedlings production activities, cleaning,

sorting and grading of gum arabic at farm gates/warehouses yet they earn less and poorly empowered.

1.3 Intervention by FAO/NGARA in the Study

Going forward in making gum arabic sector a lucrative and attractive business, where it has potential to promote economic development through higher incomes; improve livelihoods and economic empowerment of especially women, youth and the disadvantaged groups, during Second Drylands Week Conference at Ndjamena, Chad 2014, AUC and its partners, the FAO and African Forest Forum (AFF) identified sustainable production and marketing of gum arabic as one of the ways to alleviate poverty among rural communities in Africa dryland. To achieve this task AUC and its allies networked with NGARA because of it vast experience in the development of natural gums and resins in Africa drylands to produce NGARA strategy. This strategy is a veritable tool in driving the gums, resins and allied dryland resources and commodities for improving livelihoods and conservation of the environment through climate action. Therefore, this study is necessary as it forms the basis for generating baseline information a first step in the implementation process.

1.4 Description of the Objectives

i. To generate information on the status of the resource base, productivity, conservation/management status, potential areas of production, production, marketing & trade.
ii. Identify land use changes, if any, linked with the evolution of gum tree areas in the last 20 years,
iii. 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.
iv. To 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
v. Identify and profile type of gum arabic traded by each of the different actors' from producing areas based on different species in the country.
vi. 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 (as outlined by the EX-ACT data collection guidelines and questionnaires provided).
vii. 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.

viii. 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.

ix. Carry out a review of existing national policies and regulations relevant to gum arabic in the country

x. Identify avenues to strengthen the sector: Recommend areas for investment based on situational analysis, such as producer organizations and related institutional arrangement, and identify the training needs to upgrade the knowledge and skills of women and youth

## 2.0 Methodology

2.1 An Overview on the Methodology

A combination of different methods described below was be employed for the purpose of collecting the required information.

i. *Bibliographic review* from latest publications developed by different institutions on the concerned value chain that may or may not be publicly available. It is advisable to contact the institutions that focus and/or study these value chains in order to get most recently updated data.

ii. *Technical expert group meeting* - This involved identifying and interacting with a team of experts in the concerned value chain drawn from a variety of relevant technical backgrounds and institutions to gather information outlined in the data checklist.

iii. *Field rapid rural appraisal interviews* – The field data collection was conducted through rapid rural appraisal interviews with a sample of farmers. Another option was by conducting a smart phone survey, via a service provider such as MTN, which focused on 10-12 key questions. This allowed one to contact and interview different actors across each stage of the value chain, and ask specific questions that pertain to the actor. The responses to these questions facilitated the impact appraisal of the value chain. The first two methods were used as a means of generating preliminary assessment of the value chain, which was then followed by the third method of surveying as a way to cross check the relevance of the information already gathered.

iv. *Training:* Inception workshop was organised where regional/national consultants/enumerators and experts tasked with data collection and value chain analyses (including NGARA, FORIG, AFF, PAGGWA, KALRO) were taught the methodologies and tools to be employed for data collection in the field. This was important in conducting value chain analyses of NTFPs such as gum arabic, seeds etc. The training which was both in English and French focused on:

- The EX-ACT Value Chain tool – to enable appropriate data collection for appraising the financial, environmental and socio-economic impact of the NTFP value chains (by FAO RAF value chain experts and consultants)

- Gender sensitive value chain analysis – for effectively collecting gender disaggregated data that will be in line with the gender assessment and action plan required by the GCF (support provided by FAO RAF gender specialist)

- Poverty and vulnerability analysis and tools for baseline data assessment and evaluations (including qualitative and quantitative data).

v. The inception workshop was to provide opportunity to finalise and harmonise methodologies and approaches to data collection to be employed by national consultants and enumerators by:

- Carrying out a trial of the data collection methodology and questionnaires in the field to test their relevance and applicability;
- Discussing the challenges, lessons learned from the field trial, identifying the means of addressing those challenges, and
- Revising the questionnaires and methodology as necessary.

## 2.2 Methods and Approaches for Implementing each Task

2.2.1 Report on the resource base, productivity, conservation/management status, potential areas of production, production, market & trade. This key result shall be achieved with the following methodologies and approaches

- Literature review on the status of gum arabic resource management, potential area of production, marketing and trade from publications of some international organizations such as FAO, NGARA UNCTAD, IFAD, ITC, NGGW; that of national institutions like RRIN, RMRDC, GGW Nigeria, IFAD Nigeria, NAERLS, CBN, NCS, FOS; Federal and state ministries such as FMARD, FME and FMITI. Same data could be assessed from publications of private organizations and NGOs in Nigeria eg NGAPPEN. Resource national surveys report will also be reviewed to assess the relevant information. The official websites of the above mentioned organizations could be assessed online for relevant information.
- Where such information is not available online and publications of the concerned resource organizations bibliographic reviews of the books and official files of such organizations shall be undertaken to get updated data.
- Technical group meetings will be conducted with subject matter specialist in some of the above mentioned institutions to assess specific information.

2.2.1.2 Report on existing gum arabic resource maps and agro-ecological shifts due to climate change and variability in Nigeria.

- Literature review of status of land use changes occurring in Sahel and Savanna regions of Nigeria where gum arabic is found will be assessed through NAPAs websites as indicated below 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.

2.2.1.3 Report on existing programmes/projects/activities of key actors involved in the management, production, processing and trade of gum arabic; good practices and investment opportunities shall be achieved following methodologies and approaches described below

- Bibliographic reviews, technical group meetings and field rapid rural appraisals including smart phone survey will be employed to generate information on existing programmes/ projects/activities of key actors involved in the management of gum arabic resource, production, processing and trade; good practices and investment opportunities. The concerned resource state and federal ministries of agriculture, environment and trade shall be contacted to identify programmes and activities of government on gum arabic in relation to production, processing, trade, good practices and investment opportunities. Specialized agencies like CBN, NCS, RRIN, GGW Nigeria, FOS, etc publications shall be reviewed and official websites browsed to assess similar information. Same methodology and approach shall be adopted to access similar information from NAGAPPEN other private sector organizations and NGOs.

2.2.2 Report on status of production, local consumption and export of gum arabic in Nigeria will be achieved by the following methodologies and approaches:

- Review of the two national baseline survey reports on gum arabic.
- Review of resource workshop manuals and proceedings, monographs, pamphlets, books etc published by RRIN, FRIN, FDA, NAERLS etc
- Review of graduate studies thesis and dissertations available at RRIN library.
- Review of publications of resource state and federal ministries of agriculture, environment and trade at the selected gum arabic producing states and FCT Abuja
- Review of reports of NCS, FOS, SON, NAGAPPEN etc
- Technical group meetings at resource ministries of agriculture, environment and trade in selected gum arabic producing states
- Collect data from private traders and exporters mostly located in Kano state Nigeria
- Field rapid rural appraisals interviews.

2.2.3 Report on physical and chemical (characterization) of gums & tree species of gum arabic in Nigeria following methodologies and approaches described below

- Gum samples shall be collected from the trees directly on species & varietal basis and labelled. If gum production season is over before collection such samples shall be obtained from the market and labelled properly. Photographs of the gums and trees species shall be taken on species basis.
- Physical characterization/description of the gum/tree species shall be done based on visual/physical assessment deploying knowledge of subject matter specialist.
- Chemical characterization of the gum will be done following standard laboratory procedures. To achieve this, samples of the gum shall be sent to Kenya Forestry Research Institute Nairobi laboratory Headquarters of NGARA for the analysis.

2.2.4 Report on key stakeholders and their roles in the value chain in addition to price trend along the value chain and benefit sharing arrangements. The methodologies and approaches to be adopted include:

- Identifying key stakeholders and the specific roles they play in gum arabic value chain from collection to marketing in Nigeria
- In addition to the questionnaires designed for the study, focus group discussions and interviews tools will be used to obtain complementary information. This will give better understanding of the existing social groups and structures, social economic status and disparities with special focus on women and youth in the selected areas and gum arabic producing states of Yobe, Bauchi, Jigawa, Katsina and Sokoto
- Organize the questionnaires then enter the data in excel spread sheet for analysis in EX-ACT VC tool developed for gum arabic value chain.
- Based on findings draft strategies that promote sourcing, supply, value addition, sales and equitable benefit sharing arrangement along the value chain with special focus on how to scale up benefits for women and youth will be developed.

2.2.5 Information on women/youth/disadvantaged groups with regard to poverty levels & vulnerability as well as recommendation of strategies for empowerment shall be obtained using methodologies and approaches below

- Questionnaires, technical group meetings, focused group discussion, field rapid rural appraisal interviews in line with EX-ACT VC analysis shall be used to collect data from women/youth/disadvantaged groups along the gum arabic value chain in the selected communities and gum arabic producing state.

- During focused group discussions, field rapid rural appraisals and smart phone surveys with women, youth and the disadvantaged groups, questions that will ensure their interest are well represented in the new strategies to be developed will be asked.

- Recommendations of strategies that promote economic empowerment of women, youth and the disadvantaged groups will be made

2.2.6 Report on SWOT analysis on gum arabic resource existing capacities with respect to market and value addition in Nigeria highlighting issues, opportunities and challenges challenges shall take the following mythologies and approaches:

An overview of Nigeria present capacity in terms of value addition, market, trade etc with strong analysis of the strength, weaknesses, opportunities and threats out there in the wider economy highlighting issues, opportunities and challenges will pave way for development of ready investment strategies that will bring about desired change in the sector. The steps to be followed are:

- Within the consultant organization (resource research institute), different subject matter specialists shall be constituted into a small brainstorming group to build ideas about Nigeria current capacity in gum arabic sector in terms of the market and value addition. What are our strength and weaknesses inherent in the sector as well as opportunities and threats in the wider economy which can be mitigated.

- As the brainstorming session progresses, ideas generated will be recorded accordingly into SWOT matrix (grid) showing strength, weaknesses, opportunities and threats noting that people, processes and assets are internal factors while markets, competitions and wider economy are externally controlled.

- Focused group discussion. As the staff of the institute may not have monopoly of knowledge, the SWOT data collection exercise will be extended to resource ministries of agriculture, environ and trade in Yobe, Bauchi, Jigawa, Katsina and Sokoto states selected for the study including FCT Abuja. Some staff of the ministries who are knowledgeable in the subject matter will be engaged in group discussion to have their expertise ideas and opinions on the subject. The discussion shall be facilitated by the consultant. As usual as the ideas come in it will be recorded in the strength, weakness, opportunity and threat grid for further analysis and strategies development.

- Secondary source of data will be used to complement the primary sources elaborated above. The earlier resource baseline survey reports and manuals compiled by objective third parties will be reviewed and information used. This will guide against biased assessment of the SWOT analysis.

- Write report of the SWOT analysis highlighting issues, opportunities and challenges.

**2.2.7.** Report on status of the policies and legislations with respect to gum arabic resource in Nigeria as well as development of proposals on appropriate policies and legal frameworks shall be done with the following methodologies and approaches

- Literature review of existing policies and legal frameworks relevant to gum arabic sub-sector in Nigeria from the publications of specialized agencies connected to gum arabic sub sector such as RRIN, GGW, CBN, NCS, RMRDC, NAFDAC, SON,

NSCN. Official websites of above named agencies will be assessed for online information on the subject.

- Bibliographic review of files and books of resource ministry of agriculture, environment and trade at the five gum arabic producing states selected for the study to assess information on existing policy and legal frameworks. Same review will be conducted at FMARD, FME, FMITI, GGW, RMRDC, NAFDAC, SON, NCS, NSCN headquarters located in Abuja.

- Focused group discussions on the same subject will be held with some officials of resource ministries during field visits to gum arabic producing states selected for the study.

- During field visit to selected communities sensitization meetings will be held with the stakeholders, women and youth groups. During interviews and focused group discussions at community levels questions that bother on local by-laws with respect to gum arabic will be asked and the responses noted. This could help to bring about policy change that will up-scale women and youth economic empowerment and equitable benefit sharing along the resource value chain.

- Develop minutes and produce reports of meetings held with various stakeholders

- Analyse reviewed policies to identify gaps and produce draft policy strategies stating appropriate polices and regulations.

- Analyse draft policy strategy on resource value chain to ensure compliance with local and state by-laws to ensure there is coherence of the overall policy and legal frameworks.

- Write report on existing resource policies and regulations as well as proposals on appropriate policies and legal frameworks.

2.2.8.1. To write report on status of institutional frameworks and strategies for strengthening the following methodologies and approaches shall be followed.

- Literature review of publications of gum arabic resource ministries of agriculture, environment and trade shall be done. Same thing shall apply to proceedings, workshop manuals, monographs etc published by specialized agencies such as RRIN, NAERLS, RMRDC as well as NGOs and NAGAPPEN. This secondary source of data will enable one elicit relevant information on the status of institutional frameworks and arrangements, identify areas of investment opportunities and avenues to strengthen them.

- Analysis of returned questionnaires and interview results will also help to identify existing capacities of institutional frameworks and local associations

- Personal knowledge of the subject matter by consultant will be relied on in putting together information on the position of institutional frameworks and identification of avenues for strengthening

2.2.8.2 Report on training needs assessment approaches and methodologies are as described below.

Situation of Nigeria today in terms of present position of institutional frameworks and arrangements, production, market, trade, value addition etc irrespective of the species abundance, huge land mass, favourable weather, soils, people etc is a far cry from the desired capacity. This no doubt suggest huge problem. Several reasons may be responsible for the lacuna ranging from hostile environment, lack of encouragement, lack of relevant skills and knowledge etc. If lack of skills and knowledge is the problem which training can resolve them. The methodology of determining if training need exists, if it does what training is needed to fill the gap is the training need assessment. The processes that will be involved in the data collection are:

- Interview method: The target group will be youth and women involved in the resource value chain in the study area. Proposed questions that bother on gender and economic empowerment issues will be asked. In the course of the discussion other questions not originally planed for will be asked and responses noted.

- Questionnaires already designed for the study has some elements of training needs. The questionnaires will be administered and retrieved

- Focused group discussion: Some subject matter specialists at the resource ministries of agriculture, environment and trade at the selected gum arabic producing states will be constituted into small discussion groups moderated by the consultant. This will enable one have more indepth knowledge, information and their perceptions on training and economic empowerment of particularly women and youth who are the major actors along gum arabic value chain

- Observation method: This method will allow one to gather relevant information while watching the people carry out their tasks.

- Finally questions that bother on training in the returned questionnaires an interview results will be sorted, analysed and used to develop the training need assessment report

2.2.8.3 To update training manual. The following method will be adopted.

- From the training need assessment report, training needs and the type of training that is needed shall be identified. In addition, issues of whether the training can be met by existing training course, new course or to be obtained externally will be determined. This way the existing training materials will be updated

## 3.0 Results and Discussion

### 3.1 Status of the Resource Base, Productivity, Conservation/Management Status and Potential Areas of Production

Gum arabic is the dried exudate obtained from stems and branches of *Acacia senegal* (L.) Willd or *Acacia seyal*. Gum arabic tree species and their varieties are widely distributed throughout the world (Booth and Wickens, 1986) though naturally adapted to the hot, dry and barren regions of Africa particularly in areas along the southern borders of Sahara (NAS, 1979; Chikamai *et al*., 1996).

In Nigeria, high concentrations of natural stands of *A. senegal* that produce grade one gum arabic are predominantly found in north-eastern part of the country (Ojiekpon and Aghughu, 1997) though the cultivated and some wild forms occur in north western states like Kebbi, Sokoto, Zamfara, Katsina, Kano, Jigawa especially from latitude 10$^{o}$ 30'N to 12$^{o}$ 00'N as shown in Figure 3.1. Nigeria land mass covers a total of 923,763 km$^2$. Gum arabic belt spans through Sudan and Sahelian ecological zones of Nigeria. Sudan ecology is estimated at 230,940 km$^2$ while that of Sahel is 18,130 km$^2$ representing 27% of Nigeria total land mass (NPC, 2006).

In Nigeria estimated hectarage of gum arabic both cultivated and the wild form (forest reserves) is put at 2.5 million (ha) while the cultivated type comprising of government and private holdings sum up to 13,381 ha (Table 3.1.1). This represents less than 1% of the total country capacity. Yobe, Borno and Jigawa states have more plantations of gum arabic compared to other states. In most states, *Acacia senegal* occurs along side other gum producing *Acacias* such as *A seyal, A nilotica, A sieberiana, A. laeta* as well as *Combretum nigricans* and *A. polycantha* in forest reserves. This biodiversity is reminiscent of centres of origin which often constitute centres of biodiversities. The plantations are mostly *Acacia senegal* established with seeds obtained from Borno and Yobe states the area with very strong evidence of the species.


Figure 3.1: Map showing limit of occurrence of natural stands of gum arabic in Nigeria

Table 3.1.1: Estimated hectarages of private and government owned *Acacia senegal* plantations as well as natural stands of gum arabic by states in Nigeria

| States | Government (Ha) | Private (Ha) | Forest Reserve (Ha) | Total (Ha) |
|---|---|---|---|---|
| Jigawa | 428.8 | 129.3 | 480,000 | 480,558.1 |
| Borno | 492.7 | NA | 584,000 | 584,492.7 |
| Yobe | 100.7 | 9,175.7 | 540,054 | 549.330.4 |
| Kano | 160 | 106 | 150,000 | 150266 |
| Kebbi | 130 | 300.7 | 70,000 | 70,430.7 |
| Sokoto | 120 | 89 | 50,000 | 50,209 |
| Zamfara | 300 | 72.4 | 90,000 | 90,372,4 |
| Adamawa | NA | 94.5 | 50,000 | 50,094.5 |
| Taraba | 30 | 17 | 15,000 | 15,047.5 |
| Bauchi | 50 | 37.8 | 256,000 | 256,087.8 |
| Gombe | 19 | 1065.8 | 150,000 | 151,084.8 |
| Katsina | 50.2 | 411.5 | NA | 461.5 |
| **Total** | **1,881.4**** | **11,499.7**** | **2,435,054*** | **2,448,435.5** |

**Source: FDA (2002), Field Survey (2002, 2019).**

* Average 100 trees/ha. ** Average of 625 trees/ha. NA. Not available

The potential production capacity of the various gum arabic producing states in Nigeria both cultivated and wild forms in forest reserves is put at 491,034.1 tons (Table 3.1.2). Yobe and Borno put together have the capacity to produce up to 46% of the total potential gum arabic output in Nigeria followed by 20% from Jigawa state. This fit has not been maximized probably due to poor gum yield which was averaged at 0. 2 tons/ha, poor price for the commodity, long distances trekked by gum collectors in the forest where bulk of Nigeria gum is obtained etc. Cultivated gum arabic from government owned plantation or private holdings account for less than 1% of the country potential production capacity. Also, many of the plantations are not tapped during the gum season probably due to lack of skills required for tapping gum arabic trees, old age or gum exploitation may not be a priority of government owned plantations. These probably explain while bulk of Nigeria gum arabic is obtained from the wild. Consequently, the gum arabic obtained in the process gets under priced due to mixture of gum obtained from different *Acacia* gum producing species that grow side by side in the wild.

Table 3.1.2: Potential production capacity of gum arabic producing states in Nigeria

| States | Cultivated (Ha) | Forest Reserve (Ha) | Total (Ha) | Total Potential (tons) |
|---|---|---|---|---|
| Jigawa | 588.1 | 480,000.0 | 480,588.1 | 96,176.4 |
| Borno | 492.7 | 584,000.0 | 584,492.7 | 116,947.8 |
| Yobe | 9,276.4 | 540,054.0 | 549.330.4 | 110,793.5 |
| Kano | 266.0 | 150,000.0 | 150,266 | 30,079.8 |
| Kebbi | 430.7 | 70,000.0 | 70,430.7 | 14,129.2 |
| Sokoto | 209.0 | 50,000.0 | 50,209 | 10,062.7 |
| Zamfara | 372.4 | 90,000.0 | 90,372.4 | 18,111.7 |
| Adamawa | 94.5 | 50,000.0 | 50,094.5 | 10,028.4 |
| Taraba | 47.0 | 15,000.0 | 15,047.5 | 3,014.1 |

| | | | | |
|---|---|---|---|---|
| Bauchi | 87.8 | 256,000.0 | 256,087.8 | 51,226.2 |
| Gombe | 1,084.8 | 150,000.0 | 151,084.8 | 30,325.4 |
| Katsina | 461.7 | NA | 461.7 | 138.5 |
| **Total** | **1,3411.1** | **2,435,054.0** | **2,448,465.1** | **491,034.1** |

FDA (2002); Field Surve y (2019). Gum yield: Cultivated 0.3 tons/ha; Forest reserve 0.2 tons/ha.

### 3.2. Land Use Changes if Any Linked with the Evolution of Gum Tree Areas in the Last 20 Years

The different tree planting programmes undertaken by government agencies, international, corporate organisations and private farmers have resulted in the interference of the natural ecosystem. In some cases 5 to 10 years fallow lands are used for the establishment of these plantations while in extreme cases virgin forests are pulled down to establish the gum arabic plantations.

Due to the role gum arabic trees play in checking desertification and restoration of degraded lands, several local and internationally funded tree planting programmes have included gum arabic among the tree species planted in Nigeria. Most of the projects are implemented through the state ministries of agriculture/environment and Rubber Research Institute of Nigeria, Forestry Research Institute of Nigeria etc. Some of the funding organizations are NGGW, IFAD, NAGAPPEN, World Bank, Action Against Desertification (AAD) etc.

There is no clearly defined record of land use change occurring as a result of gum arabic development in the in gum arabic producing states of north east and north western Nigeria. However, Action Against Desertification (AAD) project that is planting gum arabic trees and other trees in some selected states in the two regions is 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. The main land uses in the intervention area in 2015 (the nominal baseline year) were croplands (73.6%), other land (16.1%), grasslands (4.9%), settlements (3.3%), forests (1.4%) and wetlands (0.6%)

Forest was reported to be disappearing at an alarming rate. Only 50% of the forests that existed in 2007 remained 10 years 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 areas. Grasslands and wetlands were being heavily encroached. Of the grasslands detected in 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 including gum arabic 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)

## 3.3 Appraisal of Existing Programmes/Projects/Activities of Key Actors Involved in the Management, Production, Processing and Trade of Gum Arabic, Good Practices and Investment Opportunities

### 3.3.1 Rubber Research Institute of Nigeria (RRIN)

#### 3.3.1.1 RRIN research highlights on gum arabic

Rubber Research Institute of Nigeria (RRIN) is an agency of Federal Government of Nigeria mandated to conduct research into production and development of natural rubber, gum arabic and other latex producing plants of economic importance. In this regard, Federal government of Nigeria located the institute centre for gum arabic research and development in Gashua, Yobe State in 1995. The state constitutes one of the centres of origin of the species in Nigeria. The Sub-Station also serves as the centre for the co-ordination of gum arabic research and development activities of the other fourteen gum arabic producing states of northern Nigeria.

In 1994, in a bid to redirect the national economy towards non oil exports special government intervention programme called National Accelerated Industrial Crop Production Proramme (NAICPP) was inaugurated by Federal Government of Nigeria. Under the programme production of improved planting materials of eight industrial crops including gum arabic were funded by Federal Government. The aim of the government was to ensure availability of improved planting materials for replanting of moribund farms and establishment of new plantations.

Baseline survey on the status of gum arabic production in Nigeria conducted by Federal Ministry of Agriculture, Rubber Research Institute of Nigeria and Forestry Research Institute of Nigeria revealed strong evidence of naturally occurring and cultivated gum arabic in the frontline states of northern Nigeria within Sudan and Sahelian ecological zones particularly in north eastern states of Borno and Yobe. Rubber Research Institute of Nigeria, has made deliberate effort in strategic germplasm collection of reproductive materials (seed) of *Acacia senegal* provenances and were conserved 'in situ'. The germplasm were evaluated to understand the extent of genetic variability and adaptability to the sahelian environmental conditions. These activities have identified superior provenances. The institute has advanced promising *Acacia senegal* provenances to $F_1$ hybrid via hybridization (Figure. 3.3.1.1.1) and has undergone nursery evaluation. The field assessment is in progress to further investigate and establish the vital genetic information useful for the improvement of the species.

Figure 3.3.1.1.1: Hand pollination procedure in *Acacia senegal* at Gum Arabic Research Station Gashua, Nigeria.

In the course of the study, significant variations between and within provenances which suggest possibilities of varieties within provenances were observed. From the varietal studies that followed pods, seeds and seedlings morphological characters point to *Acacia senegal* var *senegal;* var. *kerensis and* var. *leiorhachis* with distinctive characteristics as suggested by early workers as depicted by Figures 3.3.1.1.2 and 3. These varieties are presently undergoing investigation to validate the scope of variability within *Acacia senegal* in Nigeria.

*A. senegal* var. *senegal* leaf *A. senegal* var. *kerensis* leaf *A. senegal* var. *leiorhachis* leaf

Figure 3.3.1.1.2: Varieties of *Acacia senegal* namely *Acacia senegal* var *senegal*; var *kerensis* and *leiorhachis*

*A. senegal* var ***senega***/ *A. senegal var kerensis* *A. senegal* var *leiorhachis*

Figure 3.3.1.1.3: Seedlings morphological characters of *A. senegal* varieties in Nigeria

Furthermore, there was strong evidence of dearth of scientific information on basic agronomic practices with respect to gum arabic production. It is on record that most arid and semi-arid regions suffer from inadequate and erratic rainfall in addition to high rates of evaporation with the result that soil moisture often becomes limiting during growing season (Quirk, 1994; Anschutz *et al*., 1997) in addition to infertile soils that characterize gum arabic belts. To ameliorate inadequate soil moisture for the crop during growing season, pit rainwater harvesting technique was investigated and found to improve survival and establishment of seedlings in the plantation Figures 3.3.1.1.4 and 5.

Figure 3.3.1.1.4: Water harvesting in mature *Acacia senegal* trees

However, at tapping maturity water harvesting technique produced no significant variation on gum yield. This is a clear evidence of the species adaptability to the limits of weather variables and might be able to thrive under the scanty and erratic annual rainfall pattern of the environment.

Figure 3.3.1.1.5: Gum arabic exudates ready for collection from the water harvesting experiment

3.3.1.2 RRIN development activities (production of certified seedlings of *Acacia senegal)*

To ensure sustainable production and supply of grade one gum arabic in Nigeria, the Institute has continued to produce and distribute certified seedlings of grade one gum arabic seedlings for distribution to farmers annually at the Gum Arabic Research Sub-Station nursery Figure 3.3.1.2. The seedlings are sold to farmers at highly subsidized rate. The seedlings are meant for replanting of moribund gum arabic plantations as well as establishment of new ones. The practice is also aimed at guaranteeing sustainable supply of high quality gum arabic in Nigeria.

Figure 3.3.1.2: Modern gum arabic nursery at the Rubber Research Institute of Nigeria, Gum Arabic Sub-Station Gashua, Yobe State Nigeria

Quantity of certified seedlings of gum arabic (*Acacia senegal*) produced at the RRIN Gum Arabic Sub-Station Gashua from 2005-2018 was put at 3,361,684 Table 3.3.1.2 The quantity of seedlings distributed stood at 460,783 while 414.2Ha of gum arabic plantation was established. Large stock of unsold seedlings was experienced annually. The poor uptake may be due to low price (USD/ton) of Nigerian gum arabic at the international market which could serves as disincentive for investment in the sector; lack of awareness of availability of certified seedlings of *Acacia senegal* at RRIN Gashua; high cost of potted seedlings transportation, long gestation period of gum arabic trees, relative abundance of wild gum arabic producing species in the forest among others.

Table 3.3.1.2: Production and distribution of certified seedlings of gum arabic (*Acacia senegal*) to farmers by Nigerian government at RRIN Gum Arabic Sub-Station Gashua Yobe State 2005 – 2018.

| **Year** | **Quantity Produced** | **Quantity lifted** | **Hectares Established** |
|---|---|---|---|
| 2005 | 300,000 | 104,438 | 94 |
| 2006 | 300,000 | 44,444 | 40 |
| 2007 | 250,000 | 22,611 | 20.4 |

| | | | |
|---|---|---|---|
| 2008 | 400,000 | 45,000 | 40.5 |
| 2009 | 400,000 | NA | NA |
| 2010 | - | - | - |
| 2011 | 400.000 | 93,800 | 84.4 |
| 2012 | 200,000 | 39,000 | 35 |
| 2013 | 120,000 | 23,500 | 20.7 |
| 2014 | 60,000 | 30,000 | 27 |
| 2015 | 45,000 | 3,700 | 3.3 |
| 2016 | 200,000 | 20,000 | 18 |
| 2017 | 400,000 | 6,000 | 5.4 |
| 2018 | 686,284 | 28,300 | 25.5 |
| **Total** | **3,361,684** | **460,793** | **414.2** |

Source: RRIN Nursery Unit Archives 2020

### 3.3.2 National Agency for Food Drug Administration and Control (NAFDAC**)**

NAFDAC is a Federal government agency under Federal Ministry of Health that is responsible for regulation and control of the importation, exportation, manufacture, advertisement, distribution, sale and use of drugs, foods, cosmetics, medical devices, packaged water and chemicals in Nigeria. Gum arabic as a food additive is regulated by NAFDAC under food. The other functions are: compile standard specifications, regulations, and guidelines for the production, importation, exportation, sale and distribution of food, drugs, cosmetics, medical devices, bottled water, and chemicals

- Conduct appropriate tests and ensure compliance with standard specifications designated and approved by the council for the effective control of quality of food, drugs, cosmetics, medical devices, packaged water, and chemicals.
- Undertake appropriate investigation into the production premises and raw materials for food, drugs, cosmetics, medical devices, bottled water and chemicals and establish a relevant quality assurance system, including certification of the production sites and of the regulated products
- Undertake inspection of imported foods, drugs, cosmetics, medical devices, bottled water, and chemicals and establish a relevant quality assurance system, including certification of the production sites and of the regulated products.
- Undertake the registration of food, drugs, medical devices, bottled water and chemicals
- Control the exportation and issue quality certification of food, drugs, medical devices, bottled water and chemicals intended for export

### 3.3.3 Standards Organization of Nigeria (SON)

The mandate of SON includes preparation of standards relating products, measurements, materials, processes and services amongst others and their promotion at National, Regional and International levels; certification of products, assistance in the production of quality goods and services; improvement of measurement accuracies and circulation of information relating to standards. Its functions include:

- Standards (engineering, metrology, science, library services, and international cooperation collaboration).

- Quality assurance (engineering, science, and quality activities in the zones).
- Laboratory services (engineering laboratory, science laboratory, metrology laboratory, and textile laboratory).
- Special services (communications, product registration, certification and cccreditation, ports and borders operations, customers complaints and collaboration, etc).

3.3.4 National Biotechnology Development Agency (NABDA)

NABDA is an agency under Federal Ministry of Science and Technology with the responsibility to implement the policy that is aimed at promoting, coordinating, and setting research and development priority in biotechnology development in crops, forestry and livestock in Nigeria.

3.3.5 National Agency for the Great Green Wall (NAGGW)

The Great Green Wall Project is aimed at tackling the detrimental social, economic and environmental impacts of land degradation and desertification in northern Nigeria. Some of its functions include;

- Establishment of Green wall or shelterbelt from Kebbi state in North west to Borno state in North east a distance 1,500km and 15km across,
- Sensitization and awareness campaign,
- Promotion of dryland agricultural technology,
- Provision of water for irrigation and domestic uses,
- Development of Grazing resources,
- Promotion of alternative and sustainable sources of energy,
- Promotion of alternative means of livelihoods,
- Creation of enabling environment for the development of agro- based industries,

3.3.6 International Fund for Agricultural Development (IFAD)

IFAD has supported uptake of grade one gum arabic seedlings for the establishment of community based gum arabic plantations for many years in Nigeria. Its other function in include:

- IFAD's support to the Nigerian Government's poverty reduction programme in rural areas. It targets large numbers of smallholder farmers and is essentially people-centered;
- IFAD supports programmes and projects that work with communities, with smallholder farmers as the key players;
- The fund also promotes commodity based interventions that provide technical and financial support along several value chains such as livestock products, rice and other cereals, roots and tubers, vegetables and agro-forestry products;
- The objectives are to empower poor rural people, especially women, by increasing their access to resources, infrastructure and services and to promote the management of land, water and common property by local communities, thus helping to combat environmental degradation;

- IFAD supported programmes and projects that address issues such as erosion and the loss of soil fertility, as well as coastal zone natural resource management.

3.3.7 Nigeria Custom Service

Nigeria Customs Service was established in 1891. It is saddled with the responsibilities to collect accurate import and export data for economic statistical usage and planning. Its other functions include:

- Protect businesses against illegal trade malpractices
- Enforce import and export restriction and prohibitions
- Collect accurate import and export data for economic statistical usage and planning
- Intercept contraband such as illegal drugs and weapons
- Check travelers and their baggage, cargo and mail; assess and collect customs duties and other taxes on goods and services
- Work closely with other government agencies in accomplishing the collective aim of developing our great country – Nigeria

3.3.8 National Association of Gum Arabic Producers, Processors and Exporters Association of Nigeria (NAGAPPEN)

NAGAPPEN is a private sectors gum arabic commodity value chain association established 2000 in Nigeria. The members are gum arabic producers, processors and exporters. It maintains state chapters of the association in gum arabic producing states of North West and North Eastern Nigeria.

- Has over 12,000 arabic gum producers as members with facilities for procurement and storage.
- Exports gum arabic mainly to North America, South America, Eastern Europe.
- Incorporated in Nigeria.

3.3.9 Action Against Desertification (AAD)

AAD is an initiative of the African, Caribbean and Pacific Group of States (ACP) to restore drylands and degraded lands in Africa, the Caribbean and the Pacific to tackle the detrimental social, economic and environmental impact of land degradation and desertification. It is using a mix of the following activities:

- **Land restoration**: putting rural communities at the heart of restoration and up-scaling interventions to meet the massive needs.
- **Non-timber forest products**: support economic growth and sustainable management of natural resources.
- **Capacity development**: strengthening capacities in sustainable land management and land restoration.
- **Monitoring and evaluation**: collecting data, keeping track of progress, measuring impact.

- **Information sharing**: knowledge exchange and awareness raising about land degradation and desertification.
- **South-south co-operation**: sharing lessons learned on how to reverse land degradation.

AAD supports Nigeria's Great Green Wall interventions in three communities in the northern parts of Bauchi, Jigawa and Sokoto states. The activities include:

- **Land restoration**: in 2017, 1,056 hectares of degraded land were restored and 500 hectares planted with six local tree species - including Balanites and Acacia - and four native herbaceous species.
- **Non-timber forest products**: supporting village enterprises in beekeeping, honey and fodder production, Balanites oil extraction and marketing, as well as the harvesting and commercialization of gum arabic. The project also supports micro-gardens and community nurseries.
- **Capacity development**: 338 people have been trained in restoration techniques, as well as native seeds treatment and planting through direct sowing. Community associations are trained in livestock improvement, honey production, the harvesting of gum Arabic and fodder production.

3.3.10 Federal Ministry of Agriculture and Rural Development (FMARD) Gum Arabic Critical Production Supply

FMARD is gum arabic resource Ministry in Nigeria. It funded the procurement and distribution of critical gum arabic production inputs such as angle iron bars, fencing wires, tapping knives, gum arabic storage bags etc. The materials are sold to gum arabic farmers at a highly subsidized rates. The fencing materials are met for perimeter fencing of gum arabic farms to mitigate frequent browsing and trespass of young gum arabic plantations by herdsmen. This singular factor discourages potential investors in engaging in arabic cultivation.

3.3.11 Dansa Foods Processing Company

Dansa Foods Processing Company based in Kano (DFPC), is the only company in Nigeria that does secondary processing of gum arabic in addition to primary processing. The value addition activity undertaken by agents, wholesalers and exporters is primary processing.

i. Primary value addition: Wood shavings left on the tapping panels during tapping, twigs, leaves and small branches are often harvested along with the gum during collection. These impurities are removed through cleaning usually carried out by women and youth. A lot, of Nigeria gum arabic is collected from the wild where the various gum producing species grow side by side. Gum collected in such manner gets mixed hence the gum is sorted into different grades. This ensures uniform grades and qualities. The gum is usually air dried under shade until it attains safe moisture content of 15%. This can take about 2weeks depending on the weather condition. It dries faster when it is cold and windy. These processes are carried out first by the local agents/dealers, who purchase gum from farmers for the urban based wholesalers. The wholesalers further go through these processes of cleaning, sorting and drying to ensure

that their gum meet international standards as indicated in Figure 3.3.11.1 Cleaning also involve sieving to get ride of dust, fine sand and undesirable gum powder.

Figure 3.3.11.1: Cleaning of gum arabic

ii. Secondary value addition: The process involved in secondary value addition include purification, blending, attractive packing and development of easy to handle products. Dansa Foods Processing Company based in Kano (DFPC), is the only company into secondary processing of gum arabic in Nigeria. The company can process about 10 - 15 tons of raw gum arabic per day. The range of products is listed below as samples 1-3 and shown in Figure 3.3.11.2

   a) Sprayed dried grade 1 gum arabic (A*cacia senegal*)

   b) Sprayed dried grade 2 normal gum arabic (*Acacia seyal*)

   c) Sprayed dried grade 2 white gum arabic (*Acacia seyal*)

   d) Sprayed dried grade 2 special gum arabic (*Acacia laeta*)

   e) Grade 3. *Combretum nigricans* not processed

Figure 3.3.11.2: Processed sprayed dried grades 1 and 2 gum arabic

In addition, DFPC processes gum into either kibbled (crushed gum arabic) of varying granule sizes (5 -12mm) or liquid forms. The company only processes gum based on customers request that are oversea based. Two types of powdered forms are available, namely, roller dried and spray dried. They are named in accordance to the system of drying. Roller dried powdered is cheaper but takes longer to dry. The spray dried form is easier to produce, more modern and its end product commands high premium at the international market.

## 3.4 Status of National Production as per Species Types, Local Consumption, Cross Border Trade, Buffer Stock, Export of Gum Arabic from 2005-2015 and Value of Export in Nigeria

### 3.4.1 Status of Gum Arabic Production in Nigeria

In Nigeria production figures for 2002 and 2003 were estimated at 16,071 and 21,707 tons, respectively (RMRDC, 2004) while those of 2006, 2011 and 2012 were 24,260, 23,060 and 14,895, respectively (CBN, 2007, 2012 and 2013) Table 3.4.1. A ton of Nigerian raw gum arabic valued USD 4,200 in 2006 but dropped to USD 1,961, 1,615 and 1,356 in 2009, 2010 and 2011, respectively. The quantities of raw gum arabic exported from Nigeria as shown in Table 3.4.1 may not have reflected actual annual gum arabic production. This is because the quantity of gum arabic consumed locally is not included, as well as the quantity not exported, which is occasionally accumulated as stock let alone the quantities that go outside country through unauthorized sources. Demand and supply chains tend to depend on international trade data as official production and consumption data are not published regularly by exporting countries Nigeria being one of them. To overcome the inconsistency in data reporting, export data are estimated from mirror data reported by trading partners in import countries. It is easier to trace and compile import statistic than export statistics. The handlers of import trade statistic are more stringent because of tariff collections, sanitary and phyto-sanitary inspections

Table 3.4.1: Nigeria gum arabic output and value 2000 – 2016

| Year | Quantity (tons) | Value (₦) | (₦) Exch. Rate | US $/ton |
|---|---|---|---|---|
| 2000 | 8,339 | 716,987.2 | 85.98 | 1,034 |
| 2001 | 8,747 | 896,567.5 | 102.5 | 1,049 |
| 2002 | 16,071 | 1,912,449.0 | 119.0 | 1,150 |
| 2003 | 21,707 | 2,615,693.5 | 120.5 | 1.380 |
| 2004 | 17,206 | 2,210,971.0 | 128.5 | 1,150 |
| 2005 | 17,626 | 2,361,884.0 | 134.0 | 3,000 |
| 2006 | 24,260 | 3,128,185.2 | 130.2 | 4,200 |
| 2007 | 18,529 | 2,269,802.5 | 122.5 | 2,800 |
| 2008 | 18,992 | 2,236,308.0 | 117.8 | 3,000 |
| 2009 | 19,467 | 3,075,786.0 | 158.0 | 1,961 |
| 2010 | 19,467 | 2,949,445.2 | 151.5 | 1,615 |
| 2011 | 23,040 | 3,642,624.0 | 158.1 | 1,356 |
| 2012 | 14,895 | 2,357,729.6 | 158.3 | 1,990 |
| 2013 | 16,388 | 2,577,832.4 | 157.3 | NA |
| 2014 | 12,222 | 1,938,409.2 | 158.6 | 2,207 |
| 2015 | 5,854 | 1,126,309.6 | 192.4 | 2,869 |
| 2016 | 7,830 | 1,984,905.0 | 253.5 | 2,682 |
| **Total** | **270,640** | **38,001,888.9** | | |

Field Survey; CBN (2006, 2012, 2017); CBN ₦ Exch. Rate: Wikipidia Report. .

### 3.4.2 Gum Arabic Exports from Nigeria

Gum arabic exports from Nigeria were put at 19,313, 21,231 and 40,862 tons in 2005, 2006 and 2009 respectively Table 3.4.2. However, the quantity exported dropped to 5,854 and 7, 830 tons in 2015 and 2016, respectively due to global economic recession. Again, high export figures recorded for 2008-2011 may be due to discrepancies often observed between reported data and estimated data. This may due to failure of export country to submit official commodity export data. Also, it could be due to mis-reporting of a consignment true country of origin. It happens when a re-exporting country is incorrectly declared as source of a consignment. It may also be caused by wrong classification. An importing country may classify a particular consignment different from that of exporting country

Table 3.4. 2: Gum arabic export from Nigeria and the value 2000-2016

| Year | Quantity (tons) | Value ($) | US $/ton |
|---|---|---|---|
| 2000 | 8,239 | 8,5191,126 | 1,034 |
| 2001 | 8,747 | 9,175,603 | 1,049 |
| 2002 | 6,556 | 7,539,400 | 1,150 |
| 2003 | 9,532 | 13,154,160 | 1.380 |
| 2004 | 15,407 | 17,718,050 | 1,150 |
| 2005 | 19,313 | 57,939,000 | 3,000 |
| 2006 | 21,231 | 89,170,200 | 4,200 |
| 2007 | 14,463 | 40,496,640 | 2,800 |
| 2008 | 14,124 | 42,372,000 | 3,000 |
| 2009 | 40,862 | 80,130,382 | 1,961 |
| 2010 | 34,780 | 56,159,700 | 1,615 |
| 2011 | 32,341 | 65,745,563 | 1,356 |
| 2012 | 12,192 | 24,262,080 | 1,990 |

| | | | |
|---|---|---|---|
| 2013 | 11,932 | NA | NA |
| 2014 | 12,222 | 26,973,954 | 2,207 |
| 2015 | 5,854 | 16,795,126 | 2,869 |
| 2016 | 7,830 | 21,000,060 | 2,682 |
| **Total** | **275,265** | **653,823,044** | |

Source: ITC (2017). Trade map based on Comtrade statistical data

### 3.4.3 Export Values of Grades 1 and 2 Gum Arabic from Nigeria

Grades 1 and 2 of Nigeria gum arabic attained the highest value (4.200 **USD $/ton**) in 2006 Table 3.4.3 within the period under review 2000 -2009. Grade 2 was valued about half the price of grade 1. There is a strong and positive correlation between the prices of grade 1 and 2 gum arabic. However, the value of gum arabic depends on botanical source, geographical origin, grade and level of processing. *Acacia senegal* is usually valued higher than *Acacia seyal*. Nigeria gum arabic is valued less due to low qualities of the gum because large quantities of the stocks are mixed gum, contain siftings and rejects (UNCTAD, 20018)

Table 3.4.3: Export values of grades 1 and 2 gum arabic in Nigeria from 2000 - 2009

| S/No | Year | Grade 1 ($/ton) | Grade 2 ($/ton) |
|---|---|---|---|
| 1 | 2000 | 1300 | 800 |
| 2 | 2001 | 1200 | 800 |
| 3 | 2002 | 1,200 | 750 |
| 4 | 2003 | 1300 | 850 |
| 5 | 2004 | 1,600 | 750 |
| 6 | 2005 | 4,200 | 1,500 |
| 7 | 2006 | 4,200 | 1,700 |
| 8 | 2007 | 2,800 | 100 |
| 9 | 2008 | 3,000 | 2,000 |
| 10 | 2009 | 1700 | 2,950 |

Source: ITC (2010). Mediterranean and Tropical Markets.

### 3.4.4 Trade and Marketing of Gum Arabic in Nigeria

3.4.4.1 Local buying agents/dealers: These are generally natives, with vast knowledge of the farmers and gum collectors and have good knowledge of gum quality. They are able to differentiate the different grades of gum on species basis. They undertake the initial cleaning, sorting and grading of gum. They receive large chunks of money from wholesalers to buy them gum and other seasonal produce. They take their commission on every purchase made before delivery the commodity to the wholesaler who then resell to the local processor and exporters who are in urban towns.

3.4.4.2 Wholesalers: They are businessmen with strong capital base. They use agents/dealers whom they supply with capital to make farm gate or village level purchase on their behalf for a commission. They carry out their own cleaning, sorting, grading and packaging to the required standards and weights. They maintain close contacts with local processors, exporters and their agents.

3.4.4.3 Exporters: These are international businessmen who are able to secure order for supply of gum arabic to companies/industries overseas. Many of them are Asians (mostly Indians and Lebanese. The exporters are usually very conscious of the quality and grades of their products as this sustains their good reputation in the international market.

Sudan consistently dominated export of gum arabic throughout the three decades under review with an average export of 19,727 tons, 13,255 tons and 59,724 tons in 1990 -1999, 2000 – 2009 and 2010 – 2016, respectively Table 3.4.4.3. It also retained major market share values of 52%, 50% and 65% respectively within the same period. This was followed by Nigeria with an average export of 11,240 tons and 14,447 tons in 1990-1999 and 2000-2009 decades, respectively. Beyond this period Nigeria gum arabic export and market share figures reduced significantly. Between 2010 -2016 Nigeria gum arabic export and market share became 11,512 tons and 9% respectively. This period Chad became a significant player pushing Nigeria to number three position. Production and export of gum arabic became disrupted probably due to insecurity occasioned by 'Boko Haram', herdsmen attacks, cattle rustling, kidnapping and armed banditry in the major gum arabic producing states of Yobe, Borno and Adamawa states of North Eastern Nigeria. 'Boko Haram' attacked and displaced many gum arabic producing communities in these states resulting in out migration of people and a complete short down of trade and agricultural activities in the affected communities. The attacks which started in 2009 is yet to be completely abated and the communities fully resettled. However, with the renewed zeal by Federal government of Nigeria in collaboration with Multi-National Joint Task Force to completely decimate 'Boko Haram', the group has been dislodged and weakened thereby reducing their activities drastically. They only carry out occasional attacks in the fringes of particularly Borno State. Normalcy has gradually returned to many of the hitherto affected communities, many of the internally displaced persons have returned back to their communities as government, Non Governmental Organizations and Public Spirited Individuals are tryingto rebuild the communities. Businesses, agriculture and marketing activities have rebound in many of the communities. This development is expected to have positive effect in gum arabic production and trade in the area in the near future.

The declining gum exports from Sudan (50%) 2000 -2009 increased demand for gum arabic in other producing countries like Nigeria and Chad. However, recent advances in science and technology in the processing of gum arabic may have created new markets for grade 2 gum arabic market thereby increasing supply of the commodity from these regions.

Table 3.4.4.3: Gum arabic export by major Africa producing countries 2000-2016

| **Year** | **Country** | **Total (tons)** | **Average (tons/annum)** | **Market share (%)** |
|---|---|---|---|---|
| **1990-1999** | | | | |
| | Sudan | 157,818 | 19,727 | 52 |
| | Chad | 57,693 | 7,211 | 17 |
| | Nigeria | 89,917 | 11,240 | 27 |
| | Others | 32,625 | 4,078 | 4 |
| **2000- 2009** | | | | |
| | Sudan | 312,552 | 31,255 | 50 |
| | Chad | 128,488 | 12,848 | 21 |
| | Nigeria | 144,474 | 14,447 | 23 |
| | Others | 33,188 | 3,319 | 6 |
| **2010 – 2016** | | | | |
| | Sudan | 418,068 | 59,724 | 65 |
| | Chad | 91,079 | 13,011 | 14 |
| | Nigeria | 80,588 | 11,512 | 12 |

| | | | | |
|---|---|---|---|---|
| | Others | 46,699 | 6,671 | 9 |

Source: ITC (2017) Trade map based on Comtrade statistical data base

3.4.5 Local Consumption of Gum Arabic in Nigeria

Gum arabic consumed in different ways in Nigeria. It is eaten raw by some natives to stop appetite for food, as medicament in the treatment of several diseases (cough, diarrhea, dysentery, hemorrhage etc), postage stamps, local adhesives, arabic writing etc. A solution of low grade gum arabic is used to stiffen clothes and traditional head caps for men when washing or cleaning. The national local consumption of gum arabic is estimated at 92 tons/annum. This is less than 1% of Nigeria annual gum arabic output

3.4.6 Uses of Gum Arabic

Gum arabic is unique among the natural hydrocolloids because of its extreme water solubility. It gives excellent stabilizing and emulsifying properties to manufactured products such as foods, beverages and pharmaceuticals. It is tasteless, odourless and non-toxic (Anderson, 1993). *A. senegal* grade one gum arabic with optical rotation of - 0.26 to - 0.34$^{o}$ and nitrogen content of 0.27 to 0.39% is a multifunctional food additive used in confectionery, pharmaceuticals, food, beverages and brewing (Leung, 1980; Anderson, 1993). Other gum arabic not permitted as food additive include *A. seyal, A. laeta, A. Arabica* and *Combretum nigricans*. They have positive optical rotations and are mostly used in printing, lithography, cosmetics, textiles, adhesives, foundry and soaps (Anderson, 1993).

The young foliage makes good forage for livestock. The plant is useful for afforestation of arid tracts with desertification problems, soil reclamation and windbreaks. (Duke, 1981). The leaf litters form an excellent source of nitrogen and organic matter which help to improve soil structure and fertility, and when in association with microbial symbionts restores soil N through nitrogen fixation (Cossalter, 1991; Ojiekpon *et al.*, 2007). The long flexible strands of surface roots are used for cordage, well-ropes, fishing nets and horse girdles, while the wood is used for fuel wood and implement handles (Duke, 1983).

3.4.6.1 Local uses of gum arabic plant

Gum *Acacia* trees are used by local communities as source of fuel/charcoal, as feed and fodder for their livestock. The species enhance soil nutrient status through $N_2$ fixation, hence *Acacia* bushes are utilized for fallow in shifting cultivation by the peasants. The seeds and pods of *A nilotica* are used for tanning of leather in all the producing states. The branches are used to make fences. The wood bark and roots are used locally for leprosy treatment, gastro-intestinal pains and syphilis. Sometimes the gums are eaten by some natives. In Nigeria, a solution of low grade gum arabic is used to stiffen clothes and traditional head caps for men when washing or cleaning.

3.4.6.2 Local uses of gum exudates

The gum exudates is used for medicinal or religious purposes, as ink, adhesives, craft making etc. In traditional medicines, it is used for curing cough, diarrhea, dysentery, hemorrhage, treatment of skin disease and inflammations in animals, sore throats, cold, back and joint pains, kidney pains, eye diseases etc. It is also used in dry cleaning of clothes and washing male caps. This makes the clothes and caps stand firm after ironing. Gum

arabic is used generally as an additive which represent small portion of finished product. Gum arabic is a multi-functional industrial additive with technical advantages that make it difficult to completely replace it in many applications.

- Uses in food industry

  In the food industry, it imparts certain desirable qualities to feeds which are rarely obtained from other materials. In its purest form, it is non toxic, odourless, colourless when dissolved in water, tasteless and completely water soluble. It does not affect the flavour, colour or odour of other food ingredients. In foods, it is used as emulsifier, stabilizer, film former, texturizer, and low viscosity water binder. In confectionery it is used to bind water and prevent sugar crystallization. Its emulsifying properties enable fat to be distributed throughout the product.

- Uses in pharmaceutical industry

  In is used mainly for the stabilization of emulsions and formulation of tablets and pills. It controls viscosity, improves density, suspends insoluble drugs and prevents precipitation of heavy metals in drugs. It is a suspending agent in syrups.

- Uses in cosmetic industry

  It is used greatly in cosmetic industry because of its non toxicity as well as free from dermatological and allergic reactions. It functions as emulsifying and stabilizing agent in lotions and creams. It acts as foam stabilizer in liquid soaps, thickener in lipstick and binding agent in face powder.

- Uses in adhesive industry

  In the adhesive industry, glues prepared from gum arabic are light in colour, odourless, very stable and easy to prepare. Simple adhesives are made from it for paper products and when mixed with starch and dextrin, it is used as adhesive for postage stamp. It is sometimes used as a blinder or water cement used in foundry.

- Uses in lithography

  Gum arabic is used as sensitizers for lithographic plates, elements in light sensitive composition, ingredient of the fountain solution used to moisten the plates during printing and as a protective coating to prevent plate oxidation during storage.

- Uses in ink industry

  It is an important constituent of most ink, the main function of gum arabic is to act as a suspending and binding agent in the production of inks, pigments and dyes. It is used to size papers.

- Uses in textile industry

  It is widely used in the textile industry as a sizing and finishing agent and in printing formulations for imparting designs of decorations.

In Nigeria, data is not available for local consumption of gum arabic. However, in the local markets of major producing areas gum arabic producing states, pockets of trade and consumption of gum arabic is found. However, most of the gum arabic produced in Nigeria is exported.

### 3.5 Identification and Profile of Types of Gum Arabic Traded by each of the Actors from Producing Areas in the Country

Grades one and two gum arabic produced by *Acacia senegal* and *Acacia seyal*, respectively are largely obtained from Borno state followed by Yobe and Jigawa states in Nigeria. These states account for about 70% of the total gum arabic traded in Nigeria market annually. The rest come from Gombe, Bauchi, Katsina, Kano, Adamawa, Sokoto, Zamfara, Kebbi and Taraba states. Grade three is produced by *Combretum nigrican* and other Acacas. It is obtained mainly from Bauchi, Gombe, Adamawa, Taraba and Sokoto states.

#### 3.5.1 Physical Description of Nigerian Gum Arabic Tree Species

There are over 1,100 species of *Acacias* in the world but those that produce gum are very few. In Nigeria about fifteen of these species have been identified and named. Among them are grade 1 *Acacia senegal* locally known as 'Dakwara'; grade 2; *Acacia seyal* ('Faryn kaya'), grade 2 special *Acacia laeta* ('Zindi'); grade 3 C*ombretum nigrican* as shown in Figures 2 - 4. Others are *Acacia polyacath, Acacia* com*plyacantha, A. depanolobiu, Acacia nilotica, A. ataxacanth* etc. *Acacia senegal and A. seyal* have widespread distribution within the Sudan and Sahelian ecological zones of gum belt in Nigeria. *Acacia senegal* and *A. seyal* are variable species with *Acacia senegal* having about four varieties namely *Acacia senegal* var *senegal*. *Acacia senegal var kerensis, Acacia senegal var.rostata* and *Acacia senegal var leiorhachi*.

Generally, gum arabic trees are drought tolerant and can grow under sub-desert conditions with mean air temperature ranging from 14 -43$^{o}$C. It is most common in areas with rainfall 300-400mm per annum but can grow in areas with as little as 100 – 200mm with about 8-11 dry months a year (NAS, 1979; Dorthe, 2000). However, they can equally thrive in areas with annual precipitation of about 800mm. Altitude range is about 100 – 1,700m. It prefers well drained sandy soils but can grow on slightly loamy and coarse alluvial sands (Smith, 1951; Dorthe, 2000).

The plant is a deciduous tree up to 12m tall. The bark is grayish and powdery, scaly and rough with umbrella-shaped crown that is dense and low branching. The thorns occur below the nodes, short, less than 1cm in sets of three with the middle one curving downward. The leaves are small 3-8 pairs of pinnae each with 7-25 pairs of leaflets clustered together and pale green in colour. The flowers are in spike 3-12cm long, 2-3 together in the leaf axils usually creamy white but dries up to become yellow. The pods are dehiscent, straight or with curved ends about 2-18cm long and 1-3cm wide with 1-9 seeds (Duke, 1981; Dorthe, 2000). Tapping commences when the trees reach a height of 1.2 - 1.5m with a main stem diameter of about 5cm from 5-7 years of age depending on management practice (Duke, 1981; Jamal and Huntsinger, 1993). The time to tap is when the trees begin to shed their leaves at the end of the rains in October (Ojiekpon, *et al*. 2017). A special debarking tool called axe is used to remove the bark taking care not to damage the cambium. The trees are usually tapped from main stem and branches (Awouda, 1989). About 3 days later, cell

contents gather around the wound in discrete forms, which is the liquid gum. The gum solidifies slowly as it comes in contact with oxygen. First harvest usually occurs about 40 days after tapping while subsequent harvest is done 20-30 days later. Average of four harvests is possible within the gum season before the wound heals up. Gum yield of about 300g/tree/annum is common (NAS, 1979). However, yield of about 800g/tree/annum or 1 ton/ha is possible among older trees (Bhatt and Ram, 1990; Anderson, 1993). In Nigeria average gum yield of about 400kg/Ha is possible. Economic life span of the tree is about 20-25 years though some trees over 40 years still produce gum. Nonetheless, growth and production slow down considerably after 25 years (Jamal and Huntsinger, 1993). This period the farmer is best advised to cut down the plantation and replant.

(a). *Acacia senegal* (grade one gum arabic) varieties are the most widely distributed of the *Acacia species* and the most important and best quality source of gum arabic. It produces grade one gum arabic. They are deciduous small to medium sized thorny tree up to 15 m high, flat to round crown, yellowish-brown to purplish black bark, with a stem which is irregular in form and often highly branched. In contrast with other members of the *A. species,* it has characteristic sets of prickles on the branches, usually in threes with the middle one hooked downward and the lateral ones curved upward. The bark ranged from papery to not papery or peeling. Leaves are pinnate. The inflorescence is usually longer than the leaves. It is spicate, 2 –12 cm long, pedunculate. The flowers are white or cream with purplish-green calyx. The pods dehiscent, yellowish to brown, flat, papery oblong to acute round 2 – 19 x 2– 4 cm. The seeds are sub circular, olive brown in colour, 8–12 mm in diameter (Orwa *et al.,* 2009). Three varieties of *A. senegal* that have been identified in Nigeria are as described below:

(i). *Acacia senegal* var *senegal:* It has a flat or rounded crown and rough non-papery and non-peeling bark. The under bark is dark pink in colour. Trees are tall with mostly single stem. Leaves are bipinnate, small, greenish-grey, with 5 pairs of pinnae and leaflets 10 - 12 pairs (Figure 3.5.1.1a-i). Pods are 8-10 cm long with 4 - 5 seeds per pod. Seasonal flowers with purplish-green calyx (Boer, 2002). The flowers emerge before the leaves are fully formed.

*A. senegal* var *senegal* inflorescence (a)

*A. senegal* var *senegal* pods (b)

Fig 3.5.1.1a-i: *A. senegal* var *senegal* plant parts and gum


*A. senegal* var *senegal* flower (c)

*A. senegal* var *senegal* leaves (d)

*A. senegal* var *senegal*: pods (e)

*A. senegal* var *senegal*: seeds (f)

*A. senegal* var *senegal*: under bark dark pink colour (g)

*A. senegal* var *senegal* trees (h) *A. senegal* var *senegal* gum (i)

(ii). *Acacia senegal* variety *kerensis* - grows as a single or several-stemmed shrub with lateral branches forming near the base and with smooth yellowish-brown peeling bark on the stem. The under bark is cream-white in colour. Leaves are bipinnate and broader than the other two varieties, greenish-grey with 2-3 pair of pinnae and leaflets in 3-5 pair (Figure 3.5.1.2a-f). Pods are apical shape, 6 - 7cm long with 2- 3 seeds per pods. Though seasonal flowers emerged about the same time with the leaves, variety *kerensis* produce scanty flowers that are about fifty to sixty days after variety *senegal and leiorhachis* emerged. The calyx is purplish-green in colour.

*A. senegal* var *kerensis:* Leaves (a) *A. senegal* var *kerensis*: pods (b)

Fig 3.5.1.2a-f : *A. senegal* var *kerensis* plant parts and gum

*A. senegal* var *kerensis*: seeds (c) *A. senegal* var *kerensis*: creamy under bark colour (d)

*A. senegal* var *kerensis* trees (e)  *A. senegal* var *kerensis* gum (f)

(iii). variety l*eiorhachis* - Trees are short, starting with a branched bushy base then thinning out to two slender whippy erect tall stems with open rounded crown. The barks are thin, yellowish papery and peeling with red colour under bark. Young branchlets and inflorescence axis are glabrous (without hair). Leaves are small greenish-grey, with 3- 4 pair of pinnae and 8 - 10 leaflets pairs (Figure 3.5.1.3a-f). Pods are apical to acute round shape, 7 - 8 cm long with mostly 4 seeds per pod. Seasonal flowers emerged at the same time with leaves and the calyx is purplish-green in colour (Aghughu, *et al*., 2017).

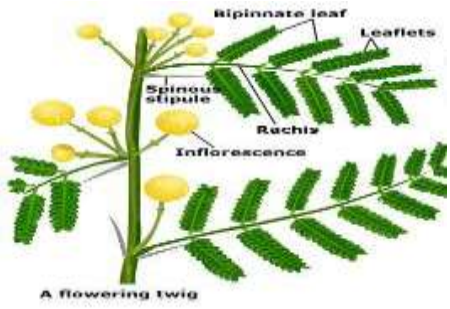
*A. senegal* var *leiorhachis*: leaves (a)  *A. senegal* var *leiorhachis*: pods (b)

Fig 3.5.1.3a-f: *A. senegal* var *leiorhachis* plant parts and gum

*A. senegal* var *leiorhachis*: seeds ©  *A.senegal* var *leiorhachis*: under bark red colour (d)

*A. senegal var leiorhachis* trees **(e)** *A. senegal* var *leiorhachis* gum (f)

(b) *Acacia seyal (*grade two gum arabic)*:* is a **s**lender tree, reaching 6 -15m in height, with a stem diameter up to 60cm and an adult tree develops a characteristic umbrella-shaped canopy. Bark is usually smooth, pale green to greenish yellow covered with powdery coating. Twig with many small reddish gland and paired axillary thorns up to 8 cm long, narrow and straight, sharp ended and grey in colour. Leaves are dark green, with 4 - 12 pair of pinnae having each 10 - 22 pair of leaflets. Rachis is up to 8cm long. Flowers clustered by 2-3 with bright conspicuous yellow globose head about 1.5cm in diameter on 3cm long penducle starting from leaves axis as shown in figure 3.5.1.4a-d. Pods hanging, slightly curved, dehiscent, light brown when matured 10-15cm long by 1 cm wide at the bottom, containing 6 -10 seed each (Houerou, 1977a).




*Acacia seyal* branch and leaves a(a) *Acacia seyal* flowers and thorns (b)

Fig 3.5.1.4 a-d-: *Acacia seyal* branch showing leaves, flowers, pods, thorn etc

*Acacia seyal* gum (c) *Acacia seyal* pods (d)

There are two varieties of *Acacia seyal*, var *seyal* and var *fistula*.

*Acacia seyal* var. *seyal*: It is pale green to gray in colour and rusty red Figures 3.5.1.5a-c. The bark is greyish black in colour in older trees.

*Acacia seyal* var *seyal* gum (a) *Acacia seyal* var *seyal* seed (b)

Fig 3.5.1.5a-c. *Acacia seyal* var *seyal* gum, pod and trees

*Acacia seyal* var *seyal* tree (c)

*Acacia seyal* var *fistula*: The bark is white or greenish yellow (Figures 4.5.1.6a-c)

*Acacia seyal* var *fistula* gum (a) *Acacia seyal* var *fistula* pods (b)

Fig 4.5.1.6a-c: *Acacia seyal* var *fistula* gum, pods and trees

*Acacia seyal* var *fistula* tree (c)

*Acacia laeta* (grade 2 special gum arabic) is a shrub or small tree which is distinct by its leaves; these are bipinnate with 3-5 pair of fairly large pinnate and 2-5 pair pinnae, the leaflets being clearly separate from each other and symmetric (Figure 3.5.1.7a-c).Thorns in pairs of recurved axillary prickles, with sometimes a third prickle recurved forward; when the latter is missing it is replaced by a leaf. Flowers are very fragrant and white-cream in colour set out in 3-8cm long spikes, pendunculate and disposed in triplet. The pods are apiculate (ending short sharp point), a character that permit easy differentiation between the *laeta* and *senegal* (Orwa *et al.,* 2009).

*Acacia laeta* leaf and flower (a)

*Acacia laeta* flower (b)

Fig 3.5.1.7a-c: *Acacia laeta* leaves, flower and gum

*Acacia laeta* gum (c)

*Combretum nigrican* (grade 3 gum arabic): Other gums that do not qualify for any of the grades described above (Figure 3.5.1.8)

Fig. 3.5.1.8: *Cumbretum nigricans* gum

3.5.2 Physical description of Nigerian gum arabic

The visible quality attributes are not only simple indicators of quality applicable under field conditions, they are also important for grading gum by collectors and traders. The gums are odourless, tasteless, glassy in appearance particularly the grade one while grad two is brittle in texture. The gums sometimes contain powder and crush depending on length of storage and mode of handling. Often times the gums get mixed because the collectors are not able to differentiate between gum arabic tree species and varieties. This is because in Nigeria gum arabic trees species and varieties grow together in the wild where bulk of the gum is obtained. However, this narrative is changing because of Nigerian government, private organizations and NGOs renewed efforts in tree planting programmes using gum arabic particularly in arid and lands. Harvested gum usually comes with impurities such as tree barks, sand particles, wood twigs, wood shavings/siftings etc. Post harvest operations (farm gate processing operations) such as cleaning, drying sorting and grading help to remove these foreign matter to ensure that the gum complies with Nigeria Industrial Standard for the specific grade of gum arabic.

3.5.3 Physico-chemical characteristics of Nigeria gum arabic

Similar to other products gum quality is determined through an assessment of it attributes. Intrinsic attributes of gum are visible and invisible. The visible attributes like the size and fullness or hardness of its nodules, colour and cleanliness can be changed intentionally (e.g. through post-harvest cleaning and sorting) or unintentionally through the products interaction with the environment e.g as the gum dries it can change colour.

Grade one gum arabic dissolves readily in cold water to form solution up to 100% solubility and 50% by weight. Moisture content which is used to determine how wet or dry the gum is and used to determine dry content of raw gum is within 15% as specified by Nigerian Industrial Standards Table 3.5.3 This is obtained after drying freshly harvested gum under well aerated shade not under bare floor nor exposed to dust. Other quality parameters such as pH, viscosity etc are as indicated in the Table.

**Table 3.5.3: Chemical characteristics of Nigeria gum Arabic**

| S/N | Parameters | Grade 1 | Grade 2 Special | Grade 2 Ordinary | Grade 3 |
|---|---|---|---|---|---|
| 1. | Moisture content 2hrs/105$^{o}$C % (max) | 15.0 | 15.0 | 15.0 | 15.0 |
| 2 | Concentration % (75g/250ml $H_2O$ (min) | 21.23 | 21.23 | 20.23 | 20.23 |
| 3 | pH | 4.2-4.6 | 4.0-4.6 | 4.0-4.6 | 4.0-4.6 |
| 4 | Viscosity Cps (1/60upm) (min) | 120 | 100 | 100 | 300 |
| 5 | Extinction value (10% clear solution Max) | 0.3000 | 0.4 | 0.4 | 0.6 |
| 6 | Colour Lovibond 200 (Max) | 1¼ | 4.0 | 5.0 | 8.0 |
| 7 | Optical Rotation at 20$^{0}$C ($^{0}$) | -25 to -37 | 0 to -10 | +20 to +60 | -40 to -60 |
| 8 | Total Ash % (Max) | 3.0 | 3.0 | 3.0 | 3.0 |
| 9 | Acid Insoluble Ash (%) (w/w) (Max) | 0.4 | 0.6 | 0.6 | 0.5 |
| 10 | Acid Insoluble matter (%) (w/w) (max) | 0.4 | 0.6 | 0.6 | 0.5 |
| 11 | Starch or Dextrins | Positive | Positive | Positive | Positive |
| 12 | Tapping bearing gum | Positive | Positive | Positive | Positive |

If the gum is properly handled it may not have problem with microbes. Microbial growth is usually a challenge of processed gum arabic than raw gum. Microbial test done on processed gum arabic include: *Escherichia coli*, S*almonella shigalla*, Total coliforms, yeast and mould.

3.5.4 List and sources of gum arabic sample sent to NGARA Nairobi for analysis

Gum arabic samples sent to NGARA Nairobi for analysis, their names, locations and sources are as indicated in Table 3.5.4

| S/N | Name of sample | Grade | Location of trees | Source |
|---|---|---|---|---|
| 1 | *Acaia senegal* var *senegal* | 1 | Tajuwa, Jakusko, LGA, Yobe state | From tree |
| 2 | Acacia senegal var *kerensis* | 1 | Tajuwa, Jakusko, LGA, Yobe | From tree |
| 3 | *Acaia senegal* var *leiorachi* | 1 | Tajuwa, Jakusko, LGA, Yobe | From tree |
| 4 | *Acaia seyal* var *seyal* | 2 | Malika, Jakusko, LGA, Yobe | From tree |
| 5 | *Acaia seyal* var *fistulal* | 2 | Malika, Jakusko, LGA, Yobe | From tree |
| 6 | *Acacia laeta* | 2 special | Buni Yard, Gujba LGA, Yobe | Commercial grade |
| 7 | *Combretum nigricans* | 3 | Alkeleri LGA, Bauchi state | Commercial grade |

International standards for gum arabic:

(a) Total ash - Raw gum =3% max
- Processed gum = 4% max
(b) $P^H$ - Between 4.2 to 4.6
(c) Extinction - 0.185
(d) Impurities - 4% max for raw gum
- 0.1% max for processed gum
(e) Moisture content - 15% max for raw gum
(f) Tannins - Nil
(g) Presence of Heavy metals-
- Arsenic not more than 0.5ppm
- Lead, not more than 1.7ppm
- Zinc, not more than 10ppm
- Copper, not more than 10ppm
(h) Starch - Nil
(i) Total Count - not more than 10.00
(j) Yeast - not more than 10
(k) Mould -not more than 10
(l) *Salmonella shigela* - zero
(m) *E. coli* - Nil

3.6.I Key Gum Arabic Stakeholders and their Roles in Nigeria

3.6.1.1 Collectors of gum arabic (producers and migrant collectors) in Nigeria

i. Migrant collectors: The migrant gum arabic collectors are mostly youth, women and adult male pastorialists. They usually transverse the sahel region of the country in search of feed, fodder and water for their animals which they rear under free range system. As they move about in the forests, they sometimes hunt for gum that exuded naturally on Acacia trees especially during gum production season. They harvest such gum and after gathering enough quantity they take the gum to nearby village market where they sell it to the village traders. Women and youth usually dominate hunting and gathering aspects of gums and resins collection. The migrant collectors usually do not care about the species or varieties of gum arabic tees they collect gum from. They bulk the gum so collected and sell to local traders regardless of species. These are herdsmen and 3heir households without permanent residence or ownership of land. As soon as water, feed and odder for their livestock get 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.

   Due to security challenges in gum arabic producing states of Nigeria, activities of migrant collectors have reduced. They are not able to move too far into the forest to hunt for gum arabi and other NTFPs so as not to encounter 'Boko Haram' terrorist group who also reside in the same forest. They were previously more than 2/3 of the producers. As it stands today they are not more than 50% of the gum collectors along gum arabic chain in Nigeria. The migrant collectors are about 1,000 per state summing up to 12,000 migrant collectors in the 12 gum arabic producing states

ii. Producers
   These are farmers that cultivate gum arbic trees in their farms, plantation or shelter belt. They may be individual, private or corporate organizations who live in the village or town as the case may be. Cultivation of gum arabic is more in farms now because of insurgents. The individual farmers and corporate organizations cultivate gum arabic purposely for income. The other category such as National Great Green Wall, Action Against Desertification, International Fund for Agricultural Development etc establish community based gum arabic plantations or shelter belts primarily for checking desertification. The income generating aspect of the enterprise is secondary. The communities are mostly the beneficiaries of the gum and other NTFPs harvested from such plantations. 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. In Nigeria land belongs to government, It is government that issues certificate of occupancy or cede tittle deeds on land. However, the community inhabitants or natives are the custodians of the land. Usually under the land tenure system the land is fragmented among family members. Under this

arrangement the natives can cultivate, develop or transfer the land to third party for a fee. The village heads ('Lawani') preside over land matters at the village level. Acquisition of large parcels of land would usually involve higher level traditional institutions and government at local and state levels. Gum arabic producers in Nigeria are very well organized. They belong to NAGAPPEN. This gum arabic producers, processors, and exporters association of Nigeria is very well organized at both state and local levels. Almost all the actors along gum arabic value chain in Nigeria belong to this association. The association has strong membership strength about 1,000 per state approximately 12,000 in the 12 gum arabic producing states. Only in few states for example Bauchi state that we have Gum Arabic Farmers Co-operative Society and other community based organizations. At a stocking density of 300 trees/ha and average gum yield of 300g/tree one household gets up to 0.47ton of gum arabic per annum. The benefit sharing arrangement among producer household income is 55% men, 20% women and 25% youth

3.6.1.2. Traders/Merchants

i. Village trader: These are merchants who are resident in gum arabic producing communities or villages. They buy gum from migrant collectors or farmers and sell to agents mostly. They buy most of their gum on markets days. They also sell directly to wholesalers in urban areas through waybill. Village traders are many and mostly dominated by male (98%). Some of them belong to community based organization like traders group.

ii. Agents: These are merchants who move from one village market to another within LGA, states and across states looking for gum arabic to buy. They transact business with village traders wholesalers, and exporters. They sell the gum to wholesalers within LGAs, state and across states**.** Most of them are funded by wholesalers and export processors. They earn between 30 and 70 USD/ton of gum arabic that they buy and resell. Agents are up to 20 per state average of 240 agents' nationwide. Each agent is capable of buying up to 100-150 tons of gum arabic per annum.. They earn up to 40-70 USD/ton of gum arabic. They are well organized. They belong to NAGAPPEN commodity association.

iii. Wholesaler: These are 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. They earn between 50 and 100 USD/ton of gum arabic they buy and sell. They usually fund the agents. The wholesalers are about 10 per state that is 120 wholesalers nationwide. Some wholesalers buy between 100-300 tons of gum arabic per annum. They are very well organized. They belong to NAGAPPEN commodity association.

3.6.1.3: Exporters: These are gum arabic merchants that live and conduct their businesses mostly in Kano and Lagos states of Nigeria. They buy gum from mostly agents and wholesalers. They undertake cleaning, sorting and grading of gum arabic before bagging for export. Their export volumes are based on the order size that they receive from their oversea based importers or companies. Based on orde size and financial capacity of some exporters, trade volumes could be up to 300-500 tons of gum arabic per annum while for high net worth companies export volumes could go up to 3,000-5000 tons gum arabic per annum.. Net income of some high net worth gum arabic exporter is between 50 and 100 USD/ton

3.6.1.4: Processors: These are individual and private organizations that are involved in primary and secondary processing of gum arabic in Nigeria. These actors major concern is value addition. They do this in order to increase the market value of the raw gum arabic. Processing of gum arabic is done in two stages. Primary processing involves cleaning, sorting and grading. This is done by almost every merchant along the distribution chain. Secondary processing of gum arabic involves blending/crushing and purification of the gum to obtain sprayed dried powdered gum arabic of different granule sizes or liquid concentrates. This requires deployment of highly sophisticated machines and manpower. Dansa food Processing Kano is the only gum arabic processing company in Nigeria. It has an installed capacity of 15 tons of raw gum arabic/day. They process gum arabic based on order size and specification prescribed by the oversea receiving company. The income from sprayed dried or kibbled gum arabic is quite handsome and worth the investment.

3.6.2 Actors Providing Support to the Sector:

3.6.2.1 Ministries, department, and agencies and their roles:

(i) Rubber Research Institute of Nigeria

Rubber Research Institute of Nigeria (RRIN) is a parastatal under Federal Ministry of Agriculture and Rural Development (FMARD) with federal government mandated to conduct research into production and development of natural rubber, gum arabic and other latex producing plants of economic importance in Nigeria. Her mission is to continuously provide innovations that will develop and transform the natural rubber, gum arabic and other aspects of latex, gums and resins industries, 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 specific mandate is to conduct research into:

- Genetic improvement of gum arabic (*Acacia senegal*), its closely related species and other resin plants of economic importance.
- Improvement of agronomic practices including cultivation and exploitation techniques of gum arabic and other resin plants
- Processing, preservation, storage and utilization of gum arabic and other derivatives.

- Design and fabricate simple processing implement and equipment for gum arabic production and exploitation.
- Farming system practices in relation to cultivation of gum arabic
- Carry out extension research liaison with relevant Federal and State Ministries, primary producers, industries and other users of research information in connection with gum arabic production, processing and utilization in collaboration with all other relevant institutes and organizations
- Extension and training of gum arabic farmers in Nigeria.
- Socio-economic studies on the cultivation, utilization and marketing of gum arabic.
- Organization of technical and vocational courses in areas relevant to the above.
- Provision of laboratory and other technical services to farmers, agro based industries and others needing these services.

(a) Impact:

i. Produces and distributes certified seedlings of gum arabic for rehabilitation of moribund gum arabic plantations and planting of new ones in Nigeria annually. In this regard, 3.36million grade one gum arabic (*Acacia senegal)* seedlings were produced by the Sub Station from 2005 to 2018.
ii. The institute has established four model grade one gum arabic seedlings out-grower nurseries in four gum arabic producing states in Nigeria namely Argungu Kebbi state, Katsina, katsina state, Malam Madori, Jigawa state and Hashidu village in Dukku Local Government Area of Gombe state. At these centres, RRIN in collaboration with concerned resource state Ministry of Agriculture/Environment produce grade one gum arabic seedlings and distribute same to gum arabic farmers nation wide. This is meant to reduce high cost of transportation and handling loses often incurred when transporting gum arabic seedlings over long distances.
iii. Production of gum arabic seedlings annually for afforestation of arid lands an adaptation and mitigation measures against climate change.
iv. Identified, collected and conserved promising provenances of *Acacia senegal* which presently serves as our 'source bush' amidst 'Boko Haram Insurgency' and COVID-19 pandemic.
v. Developed proposal for training youth groups techniques of raising selected tree seedlings in the nursery at Geildam, Yusufari and Yunusari local government areas of Yobe State. To be funded by 'Action Against Hunger'. It is a youth empowerment programme designed to arrest youth restiveness in the insurgency prone region
vi. Collected and conserved gum arabic germplasms of Yobe and Borno origin at Gashua where further genetic improvement studies are being carried out.
vii. Established tissue culture laboratory for rapid multiplication of gum arabic plantlets.

viii. Building synergies and networking between the institute and universities as well as other institutions working on gum, resins and allied commodities.

ix. In the course of gum arabic seedlings production 18,017 jobs were by the institute from 2015 to 2019 Table 3.6.2.1

Table 3.6.2.1: Jobs created along gum arabic (*Acacia senegal*) seedlings production value chain in Nigeria from 2015-2019

| S/N | PROJECT TITLE/ DESCRIPTION | LOCATION | PERFORMANCE TREND | | | | | JOB CREATED | PICTORIAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | | |
| 1 i) | Production and distribution of grade one gum arabic seedlings | RRIN Gashua Yobe state | 45,000 No gum arabic seedlings | | | | | 580 |  |
| ii) | Grade one gum arabic seedlings production value chain | RRIN Gashua | | 200,000 No gum arabic seedlings | | | | 2,581 |  |
| iii) | Grade one gum arabic seedlings production value chain | RRIN Gashua, Min of Environ Malam Madori Jigawa State, Katsina, Katsi-na state, Argun--ngu Kebbi state Gombe , Gombe State | | | 400,000 No gum arabic seedlings | | | 5,162 |  |
| iv) | Grade one gum arabic seedlings production value chain | RRIN Gashua | | | | 686,284 No gum arabic seedlings | | 8,856 |  |
| (v) | Grade one gum arabic seedlings production value chain | RRIN Gashua | | | | | 65,000 No gum arabic seedlings | 838 | |
| | Total | | | | | | | 18,017 | |

(b.) Budget:

A total of 3,361,684 *Acacia senegal* grade one seedlings were produced by RRIN Gum Arabic Sub Station Gashua, Yobe state for distribution to farmers across the twelve gum arabic producing states of Nigeria from 2005- 2018 (Table 3.6.2.2). This amounted to two

million nine hundred and seventeen thousand nine hundred dollars (USD2,917,900). The quantity of seedlings produced annually depended largely on the amount of fund injected into the institute as a special intervention funds or through regular budgetary allocation from the federal government of Nigeria. The unit cost of production increased gradually over the years in relation to inflationary rates experienced in the national economy. The seedlings are sold to the farmers at highly subsidized rates annually. Federal government of Nigeria takes up about 80% of the total cost of production while the farmers pay the balance 20% for the seedlings. This support is provided by government in order to guarantee supply of grade one gum arabic in Nigeria

Table 3.6.2.2: Budget for production and distribution of certified gum arabic (*Acacia senegal*) seedlings to farmers by Nigerian government/RRIN Gum Arabic Sub-Station Gashua, Yobe State from 2005-2018

| Year | Quantity Produced | Budget (# 000) | Exchange Rate | Value (USD 000) |
|---|---|---|---|---|
| 2005 | 300,000 | 36,000 | 134.0 | 268.7 |
| 2006 | 300,000 | 36,000 | 130.2 | 276.5 |
| 2007 | 250,000 | 30,000 | 122.5 | 244.9 |
| 2008 | 400,000 | 48,000 | 117.8 | 407.5 |
| 2009 | 400,000 | 48,000 | 158.0 | 303.8 |
| 2010 | - | - | 151.5 | - |
| 2011 | 400.000 | 60,000 | 158.1 | 379.5 |
| 2012 | 200,000 | 30,000 | 158.3 | 189.5 |
| 2013 | 120,000 | 18,000 | 157.3 | 114.4 |
| 2014 | 60,000 | 9,000 | 158.6 | 56.7 |
| 2015 | 45,000 | 6,750 | 192.4 | 35.1 |
| 2016 | 200,000 | 33,000 | 253.5 | 130.2 |
| 2017 | 400,000 | 66,000 | 333.7 | 197.2 |
| 2018 | 686,284 | 113,236.9 | 361.3 | 313.4 |
| **Total** | **3,361,684** | **497,490** | | **2,917.9** |

(ii) Federal Ministry of Agriculture and Rural Development (FMARD)

FMARD is gum arabic resource Ministry in Nigeria. The ministry contributed 50Ha parcel of land for the establishment of Gum Arabic Research Sub Station of RRIN. It funded the procurement and distribution of critical gum arabic production inputs such as angle iron bars, fencing wires, tapping knives, gum arabic storage bags etc. The materials were sold to gum arabic farmers at highly subsidized rates. The fencing materials are met for perimeter fencing of gum arabic farms to mitigate frequent browsing and trespass of young gum arabic plantations by herdsmen. This singular factor used to discourage potential investors in engaging in arabic cultivation. FMARD funded RRIN for the production and distribution of 3.36millions of certified grade one gum arabic seedlings for rehabilitation of moribund gum arabic plantations and planting of new ones at a total cost of two million nine hundred and seventeen thousand nine hundred dollars ($2,917.9m).

(iii) National Agency for Food Drug Administration and Control (NAFDAC):

NAFDAC is a Federal government agency under Federal Ministry of Health that is responsible for 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. The other functions are: compile standard specifications, regulations, and guidelines for the production, importation, exportation, sale and distribution of food, drugs, cosmetics, medical devices, bottled water, and chemicals

- Conduct appropriate tests and ensure compliance with standard specifications designated and approved by the council for the effective control of quality of food, drugs, cosmetics, medical devices, packaged water, and chemicals.
- Undertake appropriate investigation into the production premises and raw materials for food, drugs, cosmetics, medical devices, bottled water and chemicals and establish a relevant quality assurance system, including certification of the production sites and of the regulated products
- Undertake inspection of imported foods, drugs, cosmetics, medical devices, bottled water, and chemicals and establish a relevant quality assurance system, including certification of the production sites and of the regulated products.
- Undertake the registration of food, drugs, medical devices, bottled water and chemicals
- Control the exportation and issue quality certification of food, drugs, medical devices, bottled water and chemicals intended for export

(iv) Standards Organization of Nigeria (SON):

The mandate of SON includes preparation of standards relating products, measurements, materials, processes and services amongst others and their promotion at National, Regional and International levels; certification of products, assistance in the production of quality goods and services; improvement of measurement accuracies and circulation of information relating to standards. Some of its functions include:

- Standards (engineering, metrology, science, library services, and international cooperation collaboration).
- Quality assurance (engineering, technology, science, and quality activities in the zones).
- Laboratory services (engineering laboratory, science laboratory, metrology laboratory, and textile laboratory).
- Special services (communications, product registration, certification and accreditation, ports and borders operations, customer complaints and collaboration, etc).

(v) National Biotechnology Development Agency (NABDA)

NABDA is an agency under Federal Ministry of Science and Technology with the responsibility to implement the policy that is aimed at promoting, coordinating, and setting research and development priority in biotechnology for Nigeria.

(vi) Nigeria Custom Service

Nigeria Customs Service was established in 1891. It is saddled with the responsibilities to collect accurate import and export data for economic statistical usage and planning. Its other functions include:

- Protect businesses against illegal trade malpractices
- Enforce import and export restriction and prohibitions
- Collect accurate import and export data for economic statistical usage and planning
- Intercept contraband such as illegal drugs and weapons
- Check travelers and their baggage, cargo and mail; assess and collect customs duties and other taxes on goods and services
- Work closely with other government agencies in accomplishing the collective aim of developing our great country – Nigeria

(vii). National Agricultural Extension Research and Liaison Services (NAERLS)

The National Agricultural Extension and Research Liaison Services (NAERLS) of Ahmadu Bello University is one of the National Agricultural Research Institutes under the Federal Ministry of Agriculture and Rural Development (FMARD) established in 1963. The Institute has responsibilities for developing, collating, evaluating and disseminating proven agricultural technologies and innovations to end users in Nigeria. In collaboration with RRIN and FMARD, NAERLS organized training workshop on the Production and Marketing of Gum Arabic at the Gum Arabic Research Sub Station Gashua, Yobe state, 2005

The specific functions include:

• Advancement of the frontiers of agricultural extension research and services
• Conduct of agricultural performance assessment and provide feedbacks
• Build capacity and skill of key actors in agricultural extension service
• Plan, coordinate, monitor and evaluate research extension and farmers input linkage nationwide
• Package and disseminate improved agricultural innovations to target users in Nigeria
• Review and support extension.
• Conduct research in areas of technology transfer, adoption process, technology adaptation and agricultural research information systems.
• Monitor and evaluate agricultural production and information through the annual performance survey

(viii) Raw Materials Research and Development Council (RMRDC)

The Raw Materials Research and Development Council (RMRDC) is an agency of the Federal Government of Nigeria established by the RMRDC Act of 1983 promulgated into law by Decree 39 of 1987. RMRDC is under the supervision of Federal Ministry of Science and Technology. It has the national mandate to promote the development and utilization of Nigeria's industrial raw materials. It is Nigeria's focal point for the development and utilization of the nation's vast industrial raw materials resources, thus facilitating the establishment of new resource-based industries. It provided financial support for the production of 6,000 certified grade one gum arabic seedlings in 2017. The specific functions include

- ❖ Draw up policy guidelines and action programmes on raw materials acquisition, exploitation and development
- ❖ Review from time to time, raw material resources availability and utilization with a view to advising the Federal Government on the strategic implication of depletion, conservation or stock-pilling of such resources
- ❖ Advise on adoption of machinery and processes for raw materials utilization
- ❖ Encourage publicity of research findings and other information relevant to local sourcing of raw materials for industries
- ❖ Encourage growth of implant research and development capabilities
- ❖ Advise on systems for industries that achieve any break-through or make innovations and inventions
- ❖ Organize workshops, symposia and seminars from time to time designed to enlighten people on new developments and solutions discovered
- ❖ provides opportunities for hands-on entrepreneurship skill acquisition in diverse resource-based investment areas
- ❖ Offers business support, consultancy and advisory services to entrepreneurs in the area of enterprises start-up, documentation, equipment sourcing, production, business plan/feasibility studies development, ICT and marketing of products.

(ix) Federal Office of Statistics (National Bureau of Statistics)

The National Bureau of Statistics came into being with the merger of the Federal Office of Statistics and the National Data Bank. It was built under Statistics Act of 2007 by an act of parliament. The bureau coordinates statistical operations of the National Statistical System in the production of official statistics in all the Federal Ministries, Departments and Agencies, State Statistical Agencies and Local Government Councils. Generates annual production and marketing information of agricultural commodities including gum arabic

- ❖ It is responsible for implementation of the Statistical Master Plan programme document of Federal Government of Nigeria.
- ❖ Generates on a continuous and sustainable basis, socio-economic statistics on all facets of development of Nigeria economy.

(xi) Federal Ministry of Environment (FME)

FME is responsable for protection of the environment, ensuring natural resources conservation and promotion of sustainable development of the environment. In some gum arabic producing states of Nigeria such as Bauchi, Gombe, Yobe etc, it is the resource ministry for gum arabic and other resin plants

(xii) Federal Ministry of Industry Trade and Investments (FMITI)

FMITI formulates policies that help to create wealth, employment reduce poverty. It enchances service delivery in a maner that stimulate growth of the economy through trade, industrialisation and investment. It also, promotes trade of gas and non oil commodities including gum arabic

3.6.2.2 Development partners in the sector and their roles:

(i) International Fund for Agricultural Development (IFAD):

IFAD has supported uptake of grade one gum arabic seedlings for the establishment of community based gum arabic plantation for many years in Nigeria. It spent a total of two thousand eight hundred and two dollars to purchase 48,680 gum arabic *Acacia senegal* seedlings to establish 36.4Ha of gum arabic plantation in nine local government areas of Yobe state from 2009 to 2011 (Table 4.6.2.3). IFAD bought the seedlings from Gum Arabic Sub Station, Yobe state nursery Gashua, Yobe state.

Its other function in include:

- IFAD's support to the Nigerian Government's poverty reduction programme in rural areas. It targets large numbers of smallholder farmers and is essentially people- centered
- IFAD supports programmes and projects that work with communities, with smallholder farmers as the key players.
- The fund also promotes commodity based interventions that provide technical and financial support along several value chains such as livestock products, rice and other cereals, roots and tubers, vegetables and agro-forestry products.
- The objectives are to empower poor rural people, especially youth and women, by increasing their access to resources, infrastructure and services and to promote the management of land, water and common property by local communities, thus helping to combat environmental degradation.
- IFAD supported programmes and projects that address issues such as erosion and the loss of soil fertility, as well as coastal zone natural resource management in Nigeria.

(a) Knowledge generated and sharing:

- ❖ IFAD uses knowledge sharing platforms to disseminate good practices. This initiative is strongly rooted in the use of knowledge products, processes and systems. It involves the use of prints and electronic media, communication agencies and stakeholders to stimulate interests of other development goals and the government in adopting similar practices,

- ❖ Partnership with government institutions and private sector operators in meeting government or private sector targets through policy dialogues.
- ❖ Creates jobs for young people through agribusiness development.
- ❖ **Youth in agricultural network:** This agribusiness forum initiative is a network of enterprising young people across the state actively evolving as a viable platform for promoting youth-to-youth sharing and for peers among young agro-entrepreneurs.
- ❖ **Agro-enterprise incubation centres**: These are centres of knowledge and skills acquisition set-up among the women and youths who have received training in agribusiness management.
- ❖ Co-financing by government and other partners ensures the sustainability of the enterprise at the end of the project.
- ❖ Partnership: building and strengthening is crucial. IFAD has continued to collaborate and partner with government in this direction. IFAD also collaborates with gender and youth divisions in FMARD. Other partners are USAID, World Bank, AfDB etc,

(b). Capacity developed:

IFAD has improved it partnership and impact. This was done through its expertise in building the capacity, productivity and market participation of rural people. IFAD strategic framework 2016-2025 encourages involvement in reducing rural poverty at all levels of government. It strengthens farmers organizations and supports empowerment of rural poor especially women and youth.

(c.) Impact:

- ❖ Develops sustainable climate resilience and financial inclusion of young people in profitable agri-business.
- ❖ Strengthens institutions at state and community levels to work with private organizations in key value chains.
- ❖ IFAD plans to continue with Nigeria government in building rural institutions, establishing demand driven initiatives, developing profiles of smallholder agribusinesses and pursuing financial inclusion of rural households.

(d.) Budget:

IFAD spent a total of two thousand eight hundred and two dollars to purchase 48,680 gum arabic *Acacia senegal* seedlings to establish 36.4Ha of gum arabic plantation in nine local government areas of Yobe state from 2009 to 2011 (Table 3.6.2.3). IFAD bought the

seedlings at RRIN Gashua Gum Arabic Sub Station, Yobe state nursery at a control price (subsidized rate) of ten naira (#10/seedling). It also partners with Yobe state Ministry of Environment in raising assorted tree seedlings including gum arabic.

Table 3.6.2.3 : List of community based gum arabic plantations established by IFAD in Yobe State Nigeria with gum arabic seedlings lifted from RRIN Gashua 2009-2011

| S/N | Name | Farm Location | Quantity of seedlings | Budget (#) | Budget ($) |
|---|---|---|---|---|---|
| 1 | Karasuwa Community Farm | Karasuwa, Karasuwa LGA | 2,160 | 21,600 | 138.6 |
| 2 | Junbam Village Farm | Junbam, Karasuwa LGA | 3,600 | 36,000 | 230.9 |
| 3 | Barkami Farm | Barkami, Karasuwa LGA | 4,320 | 43,200 | 277.1 |
| 4 | Kalgigi Farm | Kalgigi, Machina LGA | 1,680 | 16,800 | 107.8 |
| 5 | Kortoni Farms | Kortoni Machina LGA | 1,680 | 16,800 | 107.8 |
| 6 | Yalawa | Yalawa, Machina LGA | 1,680 | 16,800 | 107.8 |
| 7 | Mafa | Mafa, Taramuwa LGA | 2,160 | 21,600 | 138.6 |
| 8 | Yusufari | Yusufari, Yusufari LGA | 5,400 | 54,000 | 346.4 |
| 9 | Damaturu | Damatutu, Damaturu LGA | 21,000 | 210,000 | 1,347 |
| | **Total** | | **43,680** | **436,800** | **2,802** |

Exchange rate (2009-2011) 1$ = #155.9; Subsidized selling price #10/seedling;
LGA: Local government area

(ii) National Agency for the Great Green Wall (NAGGW)

The Great Green Wall Project is aimed at tackling the detrimental social, economic and environmental impacts of land degradation and desertification in northern Nigeria including gum arabic producing states. The organization is a major uptaker of certified grade one gum arabic seedlings for the establishment of community based in fronline gum arabic producing states of northern Nigeria. Some of its functions include:

- Establishment of Green wall or shelterbelt from Kebbi state in North west to Borno state in North east a distance 1,500km and 15km across using some NTFPs species including gum arabic
- Sensitization and awareness campaign
- Promotion of dryland agricultural technology
- Provision of water for irrigation and domestic uses
- Development of grazing resources
- Promotion of alternative and sustainable sources of energy
- Promotion of alternative means of livelihoods
- Creation of enabling environment for the development of agro- based industries

(iii) Action Against Desertification (AAD)

AAD is an initiative of the African, Caribbean and Pacific Group of States (ACP) establihed to restore drylands and degraded lands in Africa, the Caribbean and the

Pacific to tackle the detrimental social, economic and environmental impact of land degradation and desertification. It is using a mix of the following activities:

**Land restoration**: putting rural communities at the heart of restoration and upscaling interventions to meet the massive needs.

**Non-timber forest products**: support economic growth and sustainable management of natural resources.

**Capacity development**: strengthening capacities in sustainable land management and land restoration.

**Monitoring and evaluation**: collecting data, keeping track of progress, measuring impact.

**Information sharing**: knowledge exchange and awareness raising about land degradation and desertification.

**South-south cooperation**: sharing lessons learned on how to reverse land degradation.

AAD supports Nigeria's Great Green Wall interventions in three communities in the northern parts of Bauchi, Jigawa and Sokoto states. The activities include:

**Land restoration**: in 2017, 1056 hectares of degraded land were restored and 500 hectares planted with six local tree species - including Balanites and Acacia - and four native herbaceous species.

**Non-timber forest products**: supporting village enterprises in beekeeping, honey and fodder production, Balanites oil extraction and marketing, as well as the harvesting and commercialization of gum arabic. The project also supports micro-gardens and community nurseries.

**Capacity development**: 338 people have been trained in restoration techniques, as well as native seeds treatment and planting through direct sowing. Community associations are trained in livestock improvement, honey production, the harvesting of gum arabic and fodder production.

3.6.2.3 Non governmental organizations (NGOs)

(i) National Association of Gum Arabic Producers, Processors and Exporters of Nigeria (NAGAPPEN)

NAGAPPEN is a private sectors gum arabic commodity value chain association established in Nigeria. The members are gum arabic producers, processors, and exporters. It maintains state local chapters of the association in 12 gum arabic producing states of North West and North Eastern Nigeria.

• Has over 12,000 members with facilities for procurement and storage.

• Exports mainly North America, South America, Eastern Europe.

• Incorporated in Nigeria.

(ii) Dansa Foods Processing Company Kano:

Dansa Food Processing Company is into export and processing (value addition) of gum arabic before export. The company does basic cleaning, sorting and grading of the gum before blending, purification etc. to turn different products that are listed below.

**Primary value addition**: Some Nigeria gum arabic is collected from the wild where the various gum producing species grow side by side. Gum collected in such manner gets contaminated (mixed) hence the need to sort the gum into different grades. Also, wood shavings left on the tapping panel during tapping, twigs, leaves and small branches are often harvested along with the gum during collection. These impurities are removed through cleaning process mostly done by women and youth depited in figure 4.3.11.1 displayed in previous section of this report.

**Secondary value addition**: Dansa Foods Processing Company is the only company that processes gum arabic in Nigeria. The company can process about 15 tons of raw gum arabic per day. The range of products is listed below

- Sprayed dried grade 1 gum arabic (A*cacia senegal*)
- Sprayed dried grade 2 normal gum arabic (*Acacia seyal*)
- Sprayed dried grade 2 white gum arabic (*Acacia seyal*)
- Sprayed dried grade 2 special gum Arabic (*Acacia laeta*)
- Grade 3. *Combretum nigricans* not processed

In addition DFPC processes gum into either kibbled (crushed gum arabic) of varying granule sizes (5 -12mm) or liquid forms. The company only processes gum based on customers request that are oversea based. Two types of powdered forms are available, namely, roller dried and spray dried. They are named in accordance with the system of drying. Roller dried powdered is cheaper but takes longer to dry. The spray dried form is easier to produce, more modern and its end product commands high premium at the international market.

### 3.6.3. Price Trends along the Value Chain and Benefit Sharing Arrangement

The question that bordered on price trend from 2010-2019 (question No 15 in traders and exporters groups of questionnaires, respectively) was used to determine the price trend of the different grades of gum arabic. The traders (wholesalers) that were sampled could not produce record of their annual sales price of the different grades of gum arabic. They only recalled the data from their heads hence the data used for this analysis was only from 2017-2019 even though some gave values off head up to ten years. Within the exporters category

companies that had such record were not prepared to share it. They claimed the information was classified. At the wholesalers' levels of the value chain, prices obtained from the respondents for each grade of gum arabic were summed up in each year and divided by the number of respondents to get the average price for that particular grade that year. This was step was repeated each year for other grades. This was done for buying and selling prices, respectively.

The result indicated that merchants trading along gum arabic value chain had better price offer from grade 1 gum arabic compared to the rest grades annually Table 3,6,3,1. Grade 3 gum arabic consistently recorded the lowest buying and selling prices $/ton irrespective of level of the value chain. The price of gum arabic did not follow specific direction irrespective of year and grade. This may be due to the fact that within the period under review (2017-2019) Nigeria has been having fairly stable exchange rate as bulk of the gum arabic is exported and valued in USD. The huge difference observed in the prices of the different gum arabic grades is predicated on gum qualities which determine price. This is an inherent characteristic of the species producing the different grades of gum arabic. Grade 1 gum arabic earned higher income at aech level of vale chain. It was followed by grade 2 special and grade 2 normal. Grade 3 earned the least income. The exporters appeared to earn more returns than the wholesalers.

Table 3.6.3.1: Price trend for buying and selling different grades of gum arabic at each level of the value chain in Nigeria 2017-2019

| Value chain Actors | **Buying and selling prices of different grades of gum arabic** | | | | | |
|---|---|---|---|---|---|---|
| | Buying price **(($/ton))** | | | Selling price **($/ton)** | | |
| | Grade 1 | Grade 2 | Grade 3 | Grade 1 | Grade 2 | Grade 3 |
| **Exporters:** | | | | | | |
| 2019 | 1,925 | 634 | 285 | 2,322 | 893 | 333 |
| 2018 | 1,851 | 647 | 302 | 2,322 | 861 | 333 |
| 2017 | 2,152 | 563 | 229 | 2,300 | 583 | 250 |
| **Wholesalers:** | | | | | | |
| 2019 | 1,708 | 537 | 204 | 1,949 | 729 | 268 |
| 2018 | 1,472 | 546 | 218 | 1,732 | 769 | 389 |
| 2017 | 1,583 | 537 | 194 | 1,887 | 814 | 231 |

Summary of cost and income obtained from different grades of gum arabic is shown in Table 3.6.3.2. At each level of gum arabic value chain for exmple wholesaler the cost total cost of a specific grade was determine by summing the actual cost of purchasing the raw gum arabic and other associated costs like storage, transportation, labour, packaging, toll, terminal expenses etc for each respondent. The total cost was pooled across respondents for the particular grade and then divided by number of respondents to get the average cost per year. This was repeated yearly for the three years. The same procedure was applied exporters. The result showed that grade 1 gum arabic earned higher income at each level of the vale chain. It was followed by grade 2 special and grade 2 normal. Grade 3 earned the least income. The reason for the higher price regime for grade 1 gum arabic may not be unconnected with its industrial applications especially in pharmaceuticals, food, and beverages where the lesser grades can not be applied.

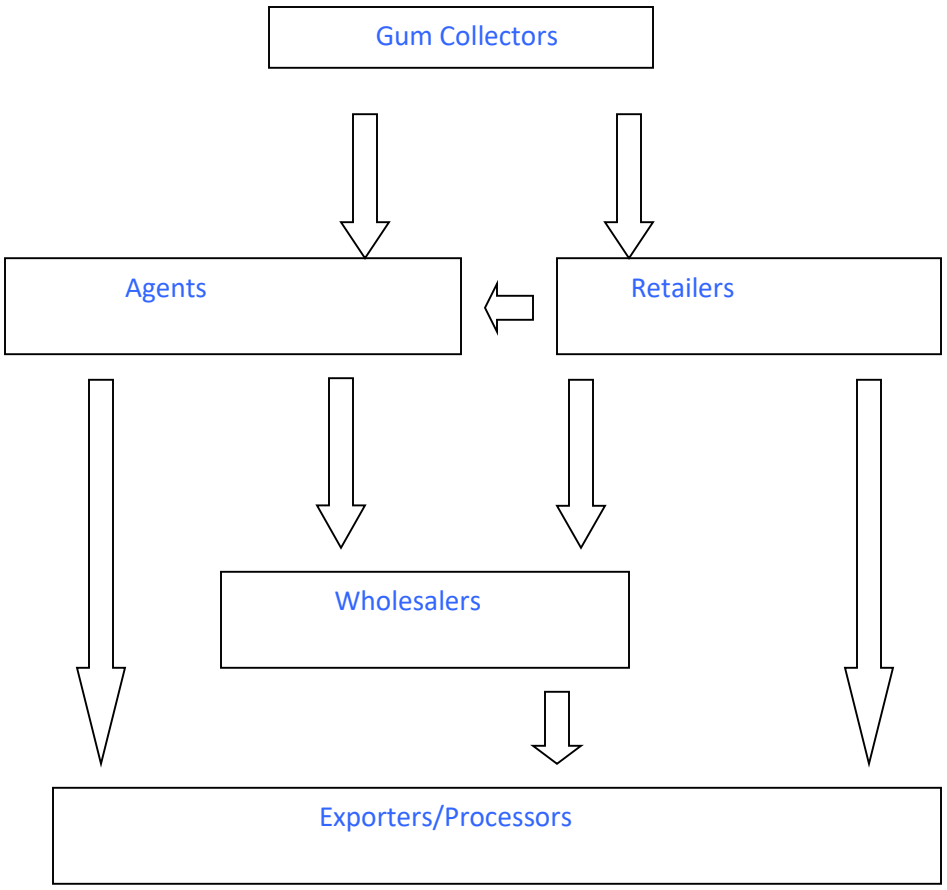
Table 3.6.3.2 Summary of cost and income from different grades of gum arabic at each

| **Gum Arabic** | **Gum arabic value chain actors** | | | |
|---|---|---|---|---|
| | **Wholesaler** | | **Exporters** | |
| | Cost ($) | Income ($) | Cost ($) | Income ($) |
| Grade 1 | 1,851 | 1861 | 2386 | 2,600 |
| Grade 2 | 617 | 639 | 997 | 1,050 |
| Grade 2 special | NA | NA | 1136 | 1,350 |
| Grade 3 | 357 | 417 | 694 | 800 |

level of the value chain actors in Nigeria 2019. NA: Not available

The benefit accruing from gum arabic value chain is skewed toward heads of households compared to others. Whereas men receive almost half (52%) of the earnings from gum arabic sales the youth and women along the value chain went away with 22 and 26%, respectively. The reason for this scenario according to the men is that as households heads they need to hold on to a significant proportion of family income for them to be in a position to provide for the family when ever financial needs arise.

**F**low Chart 3.6.3: Gum arabic marketing model flowchart from collectors to exporters/processors in Nigeria.




3.7 Data on Social and Gender Analysis Highlighting the Roles of Women/Youth/Disadvantaged Groups, Poverty and Vulnerability Assessment and Strategies for Empowerment.

Women and youth across all continents, cultures, races and ethnic groups, generally experience low social gains despite being major contributors in development, service provision as well as users of amenities. Regardless of their vulnerability, women are however very proactive in negotiating and adopting of individual and collective innovative strategies and initiatives for dealing with and adapting to changes. In Nigeria, women and youth are the ones mostly involved in haresting/collection of gum arabic from the wild/plantations, carrying out of nursery activities, drying, cleaning, sorting, grading of gum to ensure that their gum meet international standards. Cleaning also involve sieving to get ride of dust, fine sand and undesirable gum powder. Unfortunately women are the least remunerated.

3.7.1 Characteristics of Women, Youth and Disadvantage Groups in Gum Arabic Rural Settings.

i. Women and youth are the poorest of the poor in most of the gum arabic localities in Nigeria.

ii. They engage in carrying out temporary paid jobs in farms during planting, harvesting and threshing of farm produce etc. The wages they earn from such labour is barely enough for feeding.

iii. Some of them that manage to own farms lack funds to purchase necessary agricultural tools, seeds, technical services etc that can increase yields and income.

iv. They sell their little farm produce at harvest when prices are usually very low. Unfortunately, during off seasons, they buy the same food items at exorbitant prices.

v. Low income status has hindered them from engaging in savings schemes hence they cannot aggregate funds to engage in activities that will earn them additional income.

vi. Low productivity of land. The lands are open grass land and fragile often characterized by many years of cropping intensity, cut and burn farming system, degraded lands and prone to desertification. Concerted efforts are not made to apply agricultural inputs that will guarantee sustainable use of the land.

vii. Housed hold sizes are very large. This puts a lot of pressure on family resources and income.

viii. 8 Kurnari and Alagano communities in Damaturu and Fune local government areas visited respectively were attacked sometime ago by 'Boko Haram' insurgents. This group destroyed several lives and properties of many innocent Nigerians particularly in the states of Borno, Yobe and Adamawa grinding agriculture, business and trade. The inhabitants who fled the communities for safety at the heat of the crisis have gradually returned and resume their normal lives as the attacks relaxed.

ix. Household heads are in charge of households. His provides for the family and his decisions are supreme.

x. Commodity associations, women and youth groups, cooperatives etc are rear features at the community and village levels. However, NAGAPPEN is one commodity association that has penetrated the communities and well embraced by gum arabic farmers, traders etc. The farmers and traders rarely have access to extension services and inputs support programmes provided by government and NGOs. However, very recently under climate change initiatives of Yobe state government, 3,000,000 dry-land species of planting materials including certified grade one gum arabic seedlings were produced and distributed to the farmers free. Also they are to access information on gum arabic production and trade through NAGAPPEN. Similarly, to cushion the effect of 'Boko Haram' attack federal government and some NGOs have provided financial and some agricultural inputs to particularly rice farmers.

xi. Gum arabic value chain activities are not common at the community and village levels. On a few occasions gums are cleaned at home before taking it to the market for sale by household heads. Cleaning of the gum is usually done by women and youth. In Kurnari village some household heads said women do not participate in cleaning of gum for cultural and religious reasons. Cleaning, sorting and grading of gum arabic are mostly carried out at the wholesalers, processors and exporters warehouses.

xii. During periods of pressing financial needs, stored farm produce as well animals are sold to raise cash.

xiii. Gum arabic value addition activities are not common at the community and village levels. On a few occasions gums are cleaned at home before taking it to the market for sale by household heads. Cleaning of the gum is usually done by women and youth. In Kurnari village some household heads said women do not participate in cleaning of gum for cultural and religious reasons. Cleaning, sorting and grading of gum arabic are mostly carried out at the wholesalers, processors and exporters warehouses.

3.7.2 Other Non Gum Arabic Activities Engaged in by Households:

i. The gum arabic farmers also engage in the cultivation of arable crops like millet and sorghum which serve as their staple food crop while cowpea, groundnut, hibiscus and sesame seeds are sold for cash. Men and youth often go for hunting and gathering of other NTFPs such as balanites, baobabs, tamarinds etc used for domestic purposes or sold for cash.

ii. During off seasons when farming activities are low men and mostly youth often go for temporary migrate to major cities in Nigeria like Lagos, Kano, Abuja, Benin, Ibadan, Port Harcourt, Gashua, etc in search of minor jobs. They return back to the villages at the onset of rains to engage in farming activities. The income they are able to save from this venture is used for upkeep of the household with little ploughed into farming operations.

iii. Men and youth sometimes engage in craft making during off farming season. They weave fishing gears, male caps and roofing mats from ‘caba’ plant.

iv. In communities that have ‘fadama’ lands that support irrigation farming, women and youth go the irrigation sites daily to provide paid labour for planting, weeding and harvesting in the farms. Crops that are cultivated in these farms are usually, tomatoes, pepper, onions, cabbages, carrots etc. In some big sites cereals like rice, wheat and barley are cultivated. Water melon is also grown in some of the sites.

v. Some households who can afford animals sometimes buy goat, sheep and cows for fattening. They rear the animals under intensive and semi intensive systems for about 3- 6 months before taking them to the market for sale.

vi. Women and youth (girls) during off seasons often engage in food processing. For instance they can buy ground nut process it to extract oil and ground nut cake. They sell both the oil and the cake to raise the money they bought the ground nut with a little profit which they retain.

vii. Some men and youth outside farming operations own shops where they sell articles or carry out, carpentry, motor repairs, blacksmiths/welding, mobile phone repairs and charging of phones.

viii. In extreme cases youth (male) go to mostly forest reserves and farms to cut trees including gum arabic trees. They bulk the wood, arrange them in bundles and then sell as firewood.

ix. It is not uncommon to find youth (girls) and women (internally displaced persons) particularly whose bread winners have been killed 'Boko haram' begging for financial assistants to earn a living.

x. They lack access to formal credit institutions. In times of pressing financial needs they borrow money from friends and family members to solve their immediate problems Some go into local rotational target saving scheme ('adashe') to raise start up capital or solve financial difficulty.

3.7.3 Recommended Strategies for Empowerment:

i. Illegal felling of trees: The laws prohibiting cutting of trees should be strengthened. The fine imposed for illegal felling of trees many years ago is small compared to cost of goods and services today. To reduce incidences of tree felling for firewood fast growing species like neem trees, Eucalypts etc should be grown in the various communities. At maturity the plots should be shared and allocated to households which they will be harvesting periodically for their fuel wood requirements.

ii. Gum arabic value addition: In Nigeria today processing of gum arabic is mainly carried at the warehouses of wholesalers, processors and exporters residing in urban centres. Women and youth in the villages/communities could be taught the skills of cleaning, sorting and grading at the village level and paid a fee for the services rendered. This is important because labour is cheaper in the village than city. Also, benefit accruing along gum arabic value chain will be better equitably redistributed in favour of women at the localities.

iii. Proper exploitation of gum arabic trees: Knowledge gap exists today in the area of proper exploitation of gum arabic in Nigeria. In a bid to access plenty gum, the native tapers slaughter tap the trees. This practice has serious implications on gum yield and economic lifespan of the tree. Efforts should be made to train the tapers on proper exploitation and sustainable management of the tree especially as on-shelf technology exists for it at the research institute.

iv. Extension of technical/extension services to gum arabic farmers and processors: Government at levels, NGOs and international donour partners should assists in extending gum arabic technologies available at the research institute to farmers and processors Some of these technologies include: gum arabic plantation establishment and management, gum arabic nursery establishment and development, proper exploitation of gum arabic trees, farm gate processing of gum arabic, agro-forestry practices in a gum arabic based cropping system etc. As we help to build these

capacities in the farmers and processors, no doubt their productivities will increase as well as their income because they will be deploying fewer inputs and earning more.

v. Production and distribution of gum arabic production inputs: Federal and some state governments as well as NGOs have done very well in Nigeria with respect to production and distribution of gum arabic seedlings. In 2020 alone, Yobe state government produced 3,000,000 assorted dry-land tree seedlings for free distribution to farmers to mitigate the impact of climate change in the state. Interestingly, gum arabic accounted for over 50% of the total seedlings. Similarly, from 2017-2020 federal government procured large quantities of angle iron bars and barbed wires and sold to gum arabic farmers at highly subsidized rates. This was meant to reduce the incidences of trespass of gum arabic plantation by herdsmen. Where this programme is replicated, the state should ensure beneficiaries at the local government areas, farmers, private organization etc) plant the seedlings. This can be achieved through proper monitoring.

vi. Skill acquisition programmes: Women, youth and disadvantaged groups in gum arabic producing villages and communities could be taught other skills provided by NGOs, local, state and federal government. This way, their revenue sources will be diversified instead of depending solely on income from traditional food crops cultivation that has never been enough. They could be taught common skills, like hair dressing, barbing, gsm repairs, craft making. These skills do not require high level educational status to learn. At the end of the traing programmes start up kits should be provided for the trainees.

vii. Access to credit. At the village and community levels sourcing funds to engage in economic ventures is a huge problem. Due to the people's lean financial base they are not encouraged to save. The people should be taught and encouraged to save money even in the form of local 'adashe' (rotational savings). No one man has been able to do it all alone. This way they will be able to aggregate funds to start their own small business or take advantage of low price offered for bulk purchase. NGOs, government all levels can help to build these needed capacities on these ones paying the bills likely to be charged by such trainers. Similarly, women, youth and the disadvantaged groups in the localities should be encouraged to form co-operatives, youth and women groups. With this they will have a voice to negotiate collectively.

viii. Rearing of live stocks. Women, youth and disadvantaged groups at local communities should form the habit of keeping animals at least small ruminants. These animals are very prolific within a few years the place becomes filled with animals. Alternatively they could fatten the animal against a particular season (Christmas or Sallah) when there used to be bumper sales.

ix. Harvesting and processing of other NTFPs: Women, youth and disadvantaged groups in the gum arabic producing localities should be made to realize that market exists for other non timber forest products that are equally found in their localities. For instance they can harvest and process oil from neems and balanites, harvest dried pods of gao trees (*Acacia albida)* for sale or feed their animals etc.

3.8 Econnomic and Swot Analysis of Existing Capacity in the Gum Arabic Sector in Terms of Value Addition and Markets, Highligthing Issues, Opportunities and Challenges:

The SWOT analysis is highlighted in the Table 3.8 below:

3.8 Econnomic and Swot Analysis of Existing Capacity in the Gum Arabic Sector in Terms of Value Addition and Markets, Highligthing Issues, Opportunities and Challenges.

| Country | Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|---|
| Nigeria | ❖ Huge resource base that is currently underutilized with a huge domestic and international markets<br>❖ 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<br>❖ A model gum arabic processing plant with installed capacity of 15 tons of gum arabic/day<br>❖ A strong team of qualified human resource<br>❖ High competent manpower | ❖ inadequate funding for the gum arabic sector<br>❖ Low quality gum arabic due to adulteration<br>❖ Poor coordination and communication among key stakeholders<br>❖ Weak collaborations between institutions<br>❖ Lack networks | ❖ Gum trees are suitable for rehabilitation and restoration of degraded lands programmes<br>❖ Attractive prices in the local and international markets as well as new markets and niches for different types of gums<br>❖ 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<br>❖ Climate variability and climate change in the form of desertification, frequent droughts, high temperatures are major threats to the industry<br>❖ Poor annual budget performance |

3.9 Review of Existing National Policies, Laws and Regulatory Frameworks Relevant to Gum Arabic Production, Management, Restoration, and Development, Processing and Trade of Gum Arabic.

| Country | Policies/laws/ Institutions | Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|---|---|
| Nigeria | **i. Policies**<br>❖ National Accelerated Industrial Crops Production Programme 1994 | ❖ Promotion of production of eight crops with high industrial raw materials potentials including gum arabic | ❖ Lacked sustainability plan<br>❖ Not dedicated to gum arabic<br>❖ Supported only grade one gum arabic | ❖ Mass production of certified grade one gum arabic planting materials<br>❖ Massive expansion of gum arabic hectarages in gum arabic growing belt<br>❖ Guaranteed availability of future supply of grade one gum arabic in Nigeria | ❖ Poor funding<br>❖ Lack of continuity |
| | ❖ Transfer of gum arabic from Ministry of Environment to Ministry of Agriculture 1994 | ❖ Encouraged domestication and cultivation of gum arabic in plantations | ❖ Capital intensive<br>❖ Lack of enabling rules and regulations that promote sustainable private sector investment in the sector | ❖ Large scale cultivation of gum arabic in plantations across gum arabic producing states | ❖ Recurrent drought and desertification<br>❖ Frequent browsing of young gum arabic plantations by free range ruminants animals<br>❖ High cost of fencigng commercial gum arabic plantation |
| | ❖ 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<br>❖ Strategy that averts conflicts that arise from tresspassing of | ❖ Inconsistencyies in funding<br>❖ Prone to abuse<br>❖ Inadequate inputs | ❖ Availability of gum arabic critical production inputs at highly subsidized rates<br>❖ Perimeter fencing of gum arabic plantations with fencing wires and angle iron bars that would have hitherto be unaffordable by farmers | ❖ Inadequate funding<br>❖ Insecurity (Boko Haram, cattle rustlers, armed bandicts, kidnappers etc.) in the region |

| | | | | | |
|---|---|---|---|---|---|
| | ❖ Forest policy 1988 | plantations by free range ruminant animals<br>❖ Encouragement of investors into gum arabic plantation establishment and development<br>❖ Consolidation and expansion of the forest estate and its management for sustainable yield<br>❖ Forest conservation and protection of the environment<br>❖ Forest regeneration at a greater rate than exploitation<br>❖ Protection of forest from fire, poachers, trespassers and unauthorized grazers<br>❖ Development of more efficient use of wood energy and alternative sources of wood fuel<br>❖ Encouragement of private forestry<br>❖ Encouragement of agroforestry<br>❖ Development of more efficient use of wood energy and alternative source of fuel wood | ❖ Lacked enabling rules and reguslations for enforcement<br>❖ No strict adherence amd compliance to environmental protection and management<br>❖ Poor enforcement | ❖ Assist in building and strengtening capacity of communities by providing alternative sources of livelihood<br>❖ Creates opportunity for community mobilization, formation of women, youth groups and cooperatives<br>❖ Job creation for example hunting and gathering of NTFPs<br>❖ Creates opportunity for formation of NGOs, CBOs at local levels and associations at national levels for advocay and lobbying<br>❖ Supports capacity building of stakeholders and exchange programmes<br>❖ Promotes inter sectoral discussions and exchange of informtion<br>❖ Promotion of agrro-forestry andd food security<br>❖ Advocacy and awareness campaign on the effects | ❖ Hide out for insurgents (Boko Haram, cattle rustlers, armed bandicts, kidnappers etc.) in the region<br>❖ Obsolete policy need to be reviewed<br>❖ Drought and desertification<br>❖ Population pressure<br>❖ Deforestion for urbanization, agriicultture, fuel wood etc. |

| | | | | | |
|---|---|---|---|---|---|
| | | ❖ Supports capacity bilding and exchange programme<br>❖ Develops market for forest envirnmental services | | of desertification, indiscriminate felling of trees, bush fire etc<br>❖ Creates opportunity for community involvement PRA in the establishment and management of forest reserves, communty woodlots, shelter belts etc.<br>❖ Encourages production and planting of improved multipurpose planting materials.<br>❖ | |
| | **ii Laws**<br>❖ 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<br>❖ Improvement of genetic potentials of natural rubber and other gums and resin crops<br>❖ mprovement of agronomic practices including cultivation and exploitation techniques<br>❖ Improvement in processing, preservation, storage and utilization of rubber, gum arabic and their derivatives | ❖ Inadequate funding<br>❖ Poor budgetary allocation<br>❖ Poor budget performance<br>❖ Inadequate infrastructures | ❖ Development of technological inovations for intervention in natural rubber production, product development, marketing etc.<br>❖ Development of knowldge products<br>❖ Production of training manuals<br>❖ Job creation<br>❖ Capacity building of value chain actors | ❖ High turn over of scientists<br>❖ Poor funding |

| | | | | | |
|---|---|---|---|---|---|
| | | ❖ Development of control measures against pests and diseases of rubber, gum arabic and other latex producing plants<br>❖ Farming systems in relation to rubber, gum arabic and other latex- producing plants<br>❖ Has capacity for xtension and training | | | |
| | **ii Institutions**<br>❖ Rubber Research Institute of Nigeria, Gum Arabic Sub Station Gashua 1995<br><br>❖ National Association of Gum Arabic, Producers, | ❖ Special focus on gum arabic research and development, and co-ordination of gum arabic activities in the 12 gum arabic producing states<br>❖ Availability of well trained manpower for R&D functions, technical and allied services matters.<br>❖ Capacity for man power and development | ❖ Lack of authonomy<br>❖ Poor funding<br>❖ No direct budgetary allocation<br>❖ In adequate infrastructures | ❖ Development of technological inovations for intervention in gum arabic production, product development, marketing etc.<br>❖ Development of knowldge products<br>❖ Production of training manuals<br>❖ Job creation<br>❖ Capacity building of value chain actors<br>❖ Development of model gum arabic planting materials producion infrastructures in some of the resource producing states | ❖ High turn over of scientists<br>❖ High level of insecurity in the region<br>❖ Poor funding<br>❖ Weak collaboratins with institutions providing support for the sector<br><br>❖ Lack of authonomy |

| | | | | | |
|---|---|---|---|---|---|
| | Processors and Exporters of Nigeria (NAGAPPEN) 2000<br><br>❖ Federal Ministry of Agriculture and Rural Development Develoment | ❖ Has capacity for procurement and storage of gum arabic before export<br>❖ Lobby, adocacy and liaises between its members and government/other stakeholders.<br>❖ Works closely with NGARA to bring about necessary change and development of gum arabic secctor<br>❖ High and strong memship base spread across 12 gum arabic producing states<br>❖ The host ministry for gum arabic resource<br>❖ Priority instution of government<br>❖ Gets reasonable budgetary allocation annualy<br>❖ Supervises gum arabic value chain activities under agricultural transformation | ❖ Lack enabling policies and regulations for advocacy, lobby etc.<br>❖ Inadequate funding<br><br>❖ No special focus on the development of gum arabic sector by federal government.<br>❖ Inadequate infrastructure<br>❖ Poor funding gum arabic sector<br>❖ Government policy that establshed the Gum Arabic Research Sub Station of RRIN subjugated it hence poor fundng and under development | ❖ Creates vibrant market and trade of gum arabic<br>❖ Training of members<br>❖ Financing of local trade<br>❖ Interfacing with government and NGOs to improve the sector<br><br>❖ Gum arabic has massive area of coverage. It is produced in 12 states<br>❖ Gum arabic production and trade could create jobs and provide employment for our teeming youth and women who are mostly the value chain actors<br>❖ FMARD provided support for production and procurement of gum arabic production inputs that are sold to farmers at highly subsidized rates | ❖ High level of insecurity<br>❖ Climate change and climate variabilities<br>❖ Drought and desertification<br><br>❖ Lack of authonomy<br>❖ High level of insecurity<br>❖ Poor funding |

| | | | | | |
|---|---|---|---|---|---|
| | ❖ Federal Ministry of Industry Trade and Investmen | agender of federal government<br>❖ Provides support for special interventions in gum arabic value chain activities<br>❖ Supervisory ministry for gum arabic research and development including genetic and agronomic improvements, product development, processing, extension and socioeconomic studies<br>❖ 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<br>❖ Promotes trade on gas and non oil | ❖ In adequate funding funding<br>❖ Trades on all non oil commodities and gas. Does not specialize on gum arabic | ❖ In 2020 federal government gave gum arabic seedlings free to farmers as part of its COVID-19 palliatives<br>❖ Promote trade and export of non oil commodities<br>❖ Capacity building of value chain actors<br>❖ Supports value adding activities of non oil commodities | ❖ In adequate funding funding<br>❖ Insecurity in some of the regions where many of the non oil commodites are obtainged<br>❖ Drought and desertification<br>❖ Population pressure<br>❖ Deforestion for urbanization, agriicultture, fuel wood etc.<br>❖ Insecurity in most areas of opeartions |

| | | | | | |
|---|---|---|---|---|---|
| | ❖ Federal Ministry of Environment | commodities including gum arabic<br>❖ Protects environment<br>❖ Ensures natural resources conservation<br>❖ Promotes sustainable development of the environment | ❖ Not deedicated to gum arabic services.<br>❖ Uses gum arabic species only in its afforestation and climate change policies, actions and priogrammes. | ❖ Capacity building of actors along the value chains<br>❖ Supports value adding activities<br>❖ Creates opportunity for community mobilization, formation of women, youth groups and cooperatives<br>❖ Job creation for women and youth mostly engaged in hunting and gathering of NTFPs | |

3.10 Profile and Review of Existing Institutional Frameworks and Arrangements, Training Needs Assessments and Updated Training Curriculum for Women and Youth

Institutional frameworks consist of systems of formal laws, rules, regulations, organizations, customs, norms, and informal conventions in place that will shape the scope and efficiency of socio-economic activity. It is a precondition for a successful implementation of multi-sectoral and regional projects. It is necessary for preparing the ground for the project. The institutional frameworks must be stable, transparent and based on rule of law with respect for fundamental human rights. Instead of developing new institutional frameworks, it is advisable to build on and strengthen existing institutional frameworks/structures. While gender aspects can be considered in the new institutional frameworks, private sector expertise could be harnessed by the participation of civil society which could lead to better self-confidence.

After taking a critical look at the existing laws, rules, regulations, societies, policies, conventions, institutions, organizations, customs etc that shape gum arabic sector in Nigeria treated in the earlier sections, I wish to propose the institutional frameworks structure discussed below to strengthen the development of gums and resin sector in Nigeria

3.10.1 Roles and Responsibilities of National Focal Point:

3.10.1.1 In country co-ordination:

- In the country, there will be a national project coordinator, who will be responsible for the day to day management and coordination of the project at the country level. The national project coordinators will have the sole responsibility of ensuring that all the project activities at the county level are carried out according to stated objectives and all the project funds used as for the set activities and timely reports produced. He will be responsible for identifying the stakeholders, trainers and project participants at country level. The lead institution will be expected to produce the National Project Coordinator and other national project staff with time off to carry out the project duties. The institution will also pay for the salaries of the project staff, provide land, office space, utilities and vehicles for carrying out the project activities as part of the in-kind contribution

- Strengthening the organizational capacities and skills of associations, cooperatives communications among stakeholders at local and country levels

- Collaborations and communications among stakeholders at local and country levels

- Project Coordinator should have their terms of reference and clearly defined roles

- At the grassroots and national levels emphasis shall be placed on community and gender issues in gums production/exploitation

- Interface with regional and global focal points to plan and develop regional initiatives

3.10.1.1.2 Monitoring and evaluation

- Inter-ministerial committees will be set up under resource ministry. In Nigeria, gum arabic resource is domiciled in Federal Ministry of Agriculture and Rural

Development. The support ministries and agencies are Federal Ministry of Environment, Federal Ministry of Industry Trade and Investment, Federal Ministry of Water Resources, Forestry Research Institute of Nigeria, NAGAPPEN, Standards of Organisation of Nigeria, National Foods Drug Administration and Control, National Agricultural Biotechnology Development Agency, International Fund for Agricultural Development, National Great Green Wall, Action Against Desertification etc. These will form the Project Steering Committee (PSC) with a mandate to advice on policy matters, approve work plans as well as make crucial decisions with regard to the project. To ensure sustainability of the project, the activities of the project shall be mainstreamed into government plans. This will sustain the activities after the project phases out. This committee shall meet at least twice a year

- A Technical Implementation Committee (TIC) will be formed in the country. Members of the committee shall be implementing staff of the lead institution where the Project Coordinator works. The committee mandate will be work, planning, progress evaluation and reporting. The committee shall develop work plans and key documents for discussions and ratification by the PSC. They are to meet quarterly. Reporting performance of the project will be on regular basis.

3.10.1.1.3 Financial management

The project shall adopt the recommended financial and procurement plans of FAO/NGARA if any. Otherwise, Federal Government of Nigeria Financial Regulations and Procurement Act shall be adopted. Internal and external annual audits will be conducted annually to assess project implementation status, assess adherence to the procurement and financial regulations.

3.10.1.2. Role and Responsibilities of Regional Focal Point (NGARA)

The key tasks of the Regional Focal Points include: facilitating regional cooperation; providing technical assistance and leadership; collaborating and coordinating trainings, research and development of projects aimed at improving gum arabic sector; facilitating and maintaining communication among National Focal Points among others.

The overall Co-ordinator who is the principal project staff at NGARA shall regularly be invited to participate in meetings at country level to monitor and evaluate performance as well as give advice where necessary. He shall also sign all contractual agreements concerning the project alongside FAO and NGARA. He shall consolidate work plans and documents for submission to FAO.

Knowledge management (KM) will ensure that knowledge created during the project cycle will be captured, stored, processed, shared and availed for use. The project will support the design and establishment of a knowledge platform, which will include a Knowledge Management supporting infrastructure and electronic filing systems. It will be used as a knowledge products repository and will allow an easy access to

information, targeting varied audiences and allowing edits and open forums discussions and learning to promote open-access approach to data, information and project documentation in the country. All knowledge generated throughout this project will be documented and made available within this portal.

3.10.1.3 Roles and Responsibilities of Global Focal Point (FAO)

FAO is to provide the secretariat to support convening of meeting sessions. This involved organizing all logistic arrangements, preparation of the agenda and working and information documents, overseeing preparation of background study documents, and facilitating policy discussions with intergovernmental organizations.

i. Technical assistance, setting standards and protocols. It assist countries in implementing the Global Plan of Action, the GFP updates and prepares technical guidelines with respect to the four Strategic priority Areas of the Global Plan of Action

ii. Global information system for strengthening gum arabic sector : This system is intended as a global communication and information tool to enhance sharing of data, information and knowledge. It assists countries by providing contacts, sources, data and information.

iii. Providing an interactive communication service: The system require development of network that is extremely effective for sharing experiences, enabling network participants to request information, and in facilitating informal discussions among individuals involved in various aspects of the management of animal genetic resources

iv. Building national capacity in strengthening gum arabic sector: The need for training is one of the priorities continuously underlined by National Coordinators, especially from developing regions. Large range of capacity building materials including printed materials such as books, guidelines, brochures, posters; CD ROMs are produced in the process.

Capacity Development is one of the key approaches of the project to contribute to the sustainability of the project results through deepening country ownership and leadership of the development process. The project will attempt to address the capacity development of individuals, producer groups etc based on training needs assessments to ensure that the support provided responds to the needs of the beneficiaries. At least 50 persons will be trained as Trainer the Trainers on production, value addition and marketing of gums and resins. They will in turn train the others at the grass root levels in order to ensure sustainability. Capacity training workshop to be conducted at inception for policy makers, project staff and selected key stakeholders. The project will also endeavour to link registered entities with financial institutions and various markets. NGARA and the Project Coordinator will continue to monitor and backstop these groups on a continuous basis.

Series of trainings will be conducted for at least 100 members in Nigeria. Various knowledge products will be generated during the project and includes extension guides, technical notes, community briefs, pamphlets, posters, training modules and policy briefs published in user-friendly formats.

v. Awareness raising and promotion of strengthening gum arabic sector issues: This encourages key scientific officers to attended scientific conferences and meetings on strengthening of gum arabic and raise awareness of the importance and the need for their proper management. A special Web site could be set-up containing conference documents, materials from side events, information for the media.

vi. Facilitating the donor and stakeholder mechanism: Donor support has enabled participation of representatives from developing countries in meetings, and supported or enabled in-country activities in follow-up on agreement reached during these meetings. Donor support is critical in assisting countries in the preparation of country reports

vii. Collaborating with international bodies: The Global Focal Point-FAO maintains active collaboration with international bodies and organizations in addressing both sectoral and cross-sectoral issues of relevance to animal genetic resources for food and agriculture. This involves promoting both disciplinary and interdisciplinary approaches to sustainable gum arabic production, benefit-sharing and forging partnerships and close collaboration with international bodies, organizations, and institutions in undertaking various activities, especially to advance gum arabic sector

viii. Providing the secretariat for implementing the Global Plan of Action: The role of the FAO in supporting country-driven efforts to implement the Global Plan of Action, in particular is to facilitate global and regional collaboration and networks, and mobilizing donor resources to improve gum arabic sector. FAO to ensure adequate regular-programme support for the implementation of the Global Plan of Action and should pursue means within relevant international mechanisms, funds and bodies, means by which they might contribute to the implementation of the Global Plan of Action.

3.10.1.4 Avenues FAO and NGARA can help to Strengthen Gum Arabic Sector in Nigeria

3.10.1.4.1 Areas of investment:

- Identification of access and financing opportunities, and support resource mobilization
- Promote the role of women and youth in the production, processing and access to markets of gums and resins through small scale enterprises
- Promote and strengthen equitable benefit sharing along the value chain
- Promote public and private sector partnerships in gum arabic production, marketing and investments
- Quality criteria and standards to be well disseminated
- Support linkages of producers and end users

- Profile gum arabic value chain actors at various levels for ease of identification and contact
- National focal person in collaborations with NGARA set up a market information system including information on technical machineries and terms, specifications, and where to buy.
- Strengthening linkages with small and medium enterprises
- Promote investments on value adding activities
- New products and services development and transformation
- Review the existing certification schemes and standards for sustainable production, management and quality control. Identify and develop the most suitable alternatives.
- Support stable prices - standardized prices - monitor commodity prices by NGARA
- Promote gum arabic large scale investments in production, management and restoration

3.10.1.4.2 Research:

- Support production of certified and quality planting materials
- Marketing and financing mechanisms of the sector
- Creation of value addition
- Better understanding of the value chain
- Support dissemination of research on-shelf technologies through training workshops and knowledge products
- Develop improved species and varieties of gums and resins crops
- Building synergies and networking between research institutions working on gums and resins (with the support of NGARA) to learn from one another
- African Union should promote lobby for encouraging research, science and technology research in the countries
- Investment in post harvest technologies
- Domestication and inclusion of trees on farms
- Develop research on less known species
- Possibility of establishing regional gum arabic quality control laboratory by NGARA for testing and certification of regional materials.
- Genetic improvement of gum arabic (*Acacia senegal*) and other closely related species
- Improvement of agronomic practices including cultivation and exploitation techniques of gum arabic.
- Processing, preservation, storage and utilization of gum arabic and other derivatives.
- Design and fabricate simple processing implement /equipment for gum arabic production, exploitation and utilization
- Socio-economic problems of their cultivation and utilization

3.10.1.5 Status of gums and resins associations in Nigeria and how they can be strengthened.

In Nigeria, there is a vibrant and fully functional gum and resins association called National Association of Gum Arabc Producers, Processors and Exporters of Nigeria (NAGAPPEN). Others are gum arabic co-operative farmers associations, Local saving schemes (‘Adashe’).

3.10.1.5.1. NAGAPPEN:

It was registered in 2000. It has local chapters and functional executives in all the 12 gum arabic producing states of Nigeria. It has strong membership and followership. It has capacity for advocacy and lobbying of government for attention in certain areas of need. It organizes capacity building training workshops for its members in specific areas. It communicates information about current market dynamics to its members regularly. It has capacity to buy and store all gum produced in Nigeria annually thereby eliminating post harvest losses and market glut.

3.10.1.5.2. Gum arabic farmers cooperative association: They have limited spread. It is found in very few states for example Bauchi state. They function like regular cooperative societies. They pool resources to see to the welfare and wellbeing of their members.

3.10.1.6 How to Strengthen the Associations:

i. **Gum arabic** v**alue addition: P**rocessing of gum arabic is mainly carried at wholesalers, processors and exporters levels in urban centres. Women and youth in the villages/communities could be taught the skills of cleaning, sorting and grading. This is important because labour is cheaper in the village than city. Also, benefit accruing along gum arabic value chain will be better and more equitably redistributed in favour of women and youth at the localities.

ii. **Training on proper exploitation of gum arabic trees:** Knowledge gap exists in the area of proper exploitation of gum arabic in Nigeria. In a bid to access plenty gum, farmers slaughter tap the trees. This practice has serious implications on gum yield and economic lifespan of the tree. Efforts should be made to train the tapers on proper exploitation and sustainable management of the tree.

iii. **Extension of technical/extension services to gum arabic farmers, merchants and processors**: FAO should assists in extending gum arabic technologies available at the research institute to farmers and processors (farm gate). Some of these technologies include: gum arabic plantation establishment and management, gum arabic nursery establishment and development, proper exploitation of gum arabic trees, farm gate processing of gum arabic trees, agro-forestry practices in a gum a gum arabic based cropping system etc.

iv. **Production and distribution of gum arabic production inputs**: Federal and state government as well as NGOs have done well in Nigeria with respect to production and distribution of gum arabic seedlings to NGAPPEN at the various gum arabic producing states. Similarly, in 2020 alone, Yobe state government produced 3,000,000 assorted tree seedlings for free distribution to farmers to mitigate climate change in the state. Interestingly, gum arabic accounted for over 50% of the total seedlings. FAO and NGARA can replicate this programme. Other critical gum arabic production inputs could be bought and sold to farmers at subsidized rates

v. **Skill acquisition programmes**: Women, youth and disadvantaged groups in gum arabic producing villages and communities could be taught other skills. This way, their revenue sources will be diversified instead of depending solely on income from traditional food crops cultivation that has never been enough. They could be taught common skills, like hair dressing, barbing, phone repairs, craft making. These skills do not require high level of educational to learn. At the end of the traing programmes start up kits should be provided for the trainees.

vi. **Access to credit**. At the village and community levels sourcing funds to engage in economic ventures is a huge problem. Due to the people's lean financial base they are not encouraged to save. The people should be taught and encouraged to save money even in the form of local 'adashe' (rotational savings). This way they will be able to aggregate funds to start their own small business or take advantage of low price offered for bulk purchase. FAO can help to build these needed capacities on these people.

vii. Women, youth and the disadvantaged groups in the localities should be encouraged to form co-operatives. With this they will have a voice to negotiate collectively.

viii. **Harvesting and processing other NTFPs:** Women, youth and disadvantaged groups in the gum arabic producing localities should be taught how to process other non timber forest products that are equally found in their localities. For instance they can harvest and process oil from neems and balanites, harvest dried pods of *Acacia albida* (gao trees ) for sale or feed their animals etc.

ix. Assist in building and strengthening capacities of local and national associations

x. Facilitate knowledge sharing among stakeholders
xi. Advocacy and awareness campaigns
xii. Assist in formation of CBOs at community levels and associations at national levels to gain positions for advocacy
xiii. Promote awareness campaigns and education programmes in schools and colleges on sustainable management to stimulate and sustain interest of youth.
xiv. Support linkages of producers and end users

3.10.2 Training Need Assessment Report

Training need assessment was done based on interview with reference to questions that bother on gender and economic empowerment issues during questionnaire survey, focused group discussions with subject matter specialist at resource ministries etc. The responses were analysed to understand whether training need exist.

Result of the analysis showed that huge knowledge and skills gaps existed among different actors along the gum arabic value chain which training can help to address. Based on identified training needs listed below, appropriate programs will be developed to address

the training needs of the different gums arabic associations such as producers, processors, trader (merchants), exporters, women and youth groups etc in the country. Special emphasis will be given to developing the capacities of women and youth to commercially exploit gums and resins either as organized producer groups, stockiests, traders etc.

3.10.2.1. Skills and knowledge gaps of farmers in production

- The farmers lacked requisite knowledge on plantation establishment methods
- They do not know and are not using protective equipment and accessories
- They are only conversant with cleaning of gum arabic. They are not used to processing technologies
- They sell all their gum after harvesting and drying. They do not store their gum hence not used to post harvesting handling practices
- They do not have knowledge about storage after processing
- They do not know how to form association or cooperatives to improve production
- The have no knowledge of policy, regulatory consideration and institutional frameworks supporting production

3.10.2.2 Skills and knowledge gaps of traders in market and trading in selected NTFPs

- Significant percentage of the traders does not know how to form cooperatives to improve markets and trading in selected NTFPs. Only rear instances like Bauchi state that gum arabic farmers' cooperative society existed.
- They know about NAGAPPEN. Since the association is serving their interest they do not know or want to worry about how to form associations to improve markets and trading in selected NTFPs:
- Many say they do not know if brokerage exist in the market of selected NTFPs:
- The value addition most of the traders are doing is primary processing that is cleaning, sorting and grading. The only company into secondary processing is Dansa Gum Arabic Processing Company in Kano Nigeria
- Most of the traders said they do not have access to financial institutions to access credit facilities to improve markets and trading in selected NTFPs: A few of them that knew about credit institution that grants loans approached the institutions but were denied to support
- They said they do not have Knowledge on cartels exploiting farmers/actors on different markets and trading in selected NTFPs
- They had no sound knowledge on policy, regulatory consideration and institutional frameworks supporting markets and trading.

3.10.2.3. Knowlegdge and skills gaps of traders in climate change and variability on trade and market:

- A few of the traders had Knowledge on climate change and climate variability in relation to production of selected NTFPs:
- They had limited Knowledge on production and trade in selected NTFPs for mitigation and adaptation to climate change:

- They had very limited Knowledge on climate change policy, regulatory consideration and institutional frameworks supporting production and trade in selected NTFPs:

3.10.2.4 Knowlegdge and skills gaps of exporters in production and processing of selected NTFPs

- Some of the exporters said they had some knowledge in production methods because they were trained sometimes ago by Central Bank of Nigeria and Nigeria Import and Export Bank
- Many exporters had no knowledge in processing technologies. All they do is cleaning, sorting and grading of gum arabic. Dansa Gum Arabic Processing Company Kano is the only company into real time processing of gum arabic into different products such as kibbled and sprayed dried gum
- They had moderate Knowledge on formation of associations to improve production levels of selected NTFPs
- Knowledge on formation of cooperatives to improve production levels of selected NTFPs:
- They have slight Knowledge on sustainable management and use of different species producing selected NTFPs:
- They had slight knowledge on policy, regulatory consideration and institutional frameworks supporting production:
- Knowledge on formation of cooperatives to improve markets and trading in selected NTFPs:

3.10.2.5. Knowledge and skills gaps of exporters in markets and trading in selected NTFPs

- Some of the export had moderate Knowledge on the formation of associations to improve markets and trading in selected NTFPs:
- Many of the exporters are only conversant with primary value addition (cleaning, sortin and grading). They have little or no knowledge in secondary value addition to target certain markets trading in selected NTFPs except Dansa Gum Arabic Processing Company.
- Few exports had knowledge on financial institutions and accessing credit facilities to improve markets and trading in selected NTFPs.
- Many of the exporters had limited Knowledge on policy, regulatory consideration and institutional frameworks supporting markets and trading selected NTFPs.

3.10.2.6 Knowledge of Exporters on Climate change and variability on production and export of NTFPs

- Majority of the exporters only had moderate knowledge on climate change and climate variability in relation to production of selected NTFPs:
- They have very limited Knowledge on production and trade in selected NTFPs for mitigation and adaptation to climate change:
- Very few exporter had knowledge on climate change policy, regulatory consideration and institutional frameworks supporting production and trade in selected NTFPs:

3.10.3 Training Curriculum

i. Gum arabic nursery establishment and development
ii. Gum arabic plantation establishment and management
iii. Gum arabic tree species identification and seed collection
iv. Proper exploitation of gum arabic trees and field hygiene practices
v. Tapping and post harvest handling of gums and resins
vi. Processing, packaging and storage of gums and resins
vii. Agro-forestry practices in gum arabic based cropping system
viii. Formation of community based organizations, cooperatives and national associations
ix. Capacity building on enterprenureship and sourcing of funds for gum and resins enterprises
x. Policy, rules and regulations in gum and resins production and trade
**xi.** Advocacy and awareness campaign on the effects of climate change and variabilities on gum and resin production and trade.

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

To make gum arabic sector a lucrative and attractive business in eight Africa countries, where it has potential to promote economic development through higher incomes; improve livelihoods and economic empower of especially women, youth and the disadvantaged groups FAO and NGARA worked out fund for intervention in gum arabic of the benefiting countries. First step in the implementation of the project NGARA FAO hired consultants one each from benefiting countries. The job of the consultant was to conduct a study on gum and resins sector of each country and then put up a report of the status of production, productivity, conservations, policy, rules and regulations, institutional frameworks that shape the sector etc. The report was meant to be used to develop bankable proposal required to engage the sector. The report has been developed and being harmonized by NGARA FAO..

## 4.2 Recommendations

The study report has been developed. A lot of issues were identified and addressed in the report. Recommendations were made on what to do and actions to take to improve on the sector to create better life and living conditions for our rural community inhabitants especially youth and women who are the key players of gum arabic sector. I will suggest we refer to the sections of the report that have articulated what could be done to improve on gum arabic sector in each country, FAO should then go ahead to implement some of the key recommendations identified under areas of investments, research and training.

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## ANNEXES

Annex 1: Workshop Programme

**Draft Agenda**

**Group 1** = Lead enumerators/data collection and experts

| Day | Time | Activity | Presenters/Facilitators |
|---|---|---|---|
| *Sunday, 9 Feb* | | Arrival of participants in Kumasi, Ghana | |
| **Day 1**<br><br>*Monday, 10Feb*<br><br>**Introduction on Great Green Wall, SURAGGWA, GCF and climate change rationale** | **08:00-08:30** | **Registration** | |
| | 08:30-09:30 | -Opening and welcome<br>- Introduction of participants<br>-Workshop proposed objectives and expected outcomes | FAO/PAGGW/ FORIG<br><br>Martin/Nora |
| | 09:30-10:45 | Introduction presentations<br>• Africa's Great Green Wall : context and FAO's involvement<br>• Ecosystem restoration experiences in the Sahelin Particular FAO-EU-ACP Action against Desertification project – lessons learnt<br>• Mapping of other initiatives/ projects/ lessons learnt | PAGGW/FAO<br><br>FAO AAD team (presented by Damas Poda, AAD project national project coordinator)<br><br>All |
| | *10:45-11:00* | *Coffee break* | |
| | 11:00-13:00 | Introduction to the Green Climate Fund (GCF)<br><br>The Multi-country FAO/GCF project: **Scaling-Up Resilience in Africa's Great Green Wall** | Martin<br><br>Nora |
| | *13:00-14:00* | *Lunch* | |
| | 14:00 – 15.30 | Climate Change Rationale for SURAGGWA<br>Presentation and country-level working groups (6 Groups) | Rosalie (PPT)<br><br>Martin (introduction to WG work) |
| | *15.30-16.00* | *Coffee break* | |
| | 16:00 – 17:40 | Carbon Accounting:Introduction to FAO's Ex-Act tool and EX-ACT Value Chain tool | Louis Bockel, FAO<br><br>Padmini Gopal, FAO |
| | 17:40 | Daily evaluation | |
| | | | |
| **Day 2** | 8:30- 9:30 | a) Poverty and vulnerability tools: what information can we expect, and can I use it for my formulation? And options for rationale for sequencing with other | |

| | | | |
|---|---|---|---|
| *Tuesday, 11 Feb*<br><br>***Morning:***<br>**Groups 1 and 2 together**<br><br>***Afternoon:***<br>**Group 1 - Data collection training**<br><br>**Group 2 –Project formulation** | | quantitative tools a) *qualitative baseline analysis.*<br><br>Results and lessons learnt from first qualitative baseline analysis (NGARA) in northern Nigeria | Pamela Pozarny |
| | 9:30-10:45 | b) Poverty and vulnerability tools: what information can we expect, and can I use it for my formulation? b) *quantitative baseline analysis.* | Ana Paula/Nick …FAO |
| | *10:45-11:15* | *Coffee break* | |
| | 11:15-12:00 | Gender sensitive data collection and tools. Gender Assessment and Action Plan. | KatrienHolvoet, FAO<br><br>Pious Asante, FAO |
| | *12:00-13:00* | *Lunch* | *[after lunch, groups 1 & 2 separate]* |
| | *13:00 – 15:00* | *EX-ACT VC practice exercises* | Interactive group facilitated by :<br><br>• Louis Bockel, FAO<br>• Padmini Gopal, FAO |
| | *13:00-15:00* | Harmonization of baseline evaluations (Pamela, Ana Paula, Nick, Martin, Nora, Nadim, Katrien, Ben, Godwin, Daniel, Zougoulou, Justin, Cheikh, Yoann, Damas, Victor) | Interactive group workfacilitated by Martin/Justin |
| | *15:00-15:30* | *Coffee break* | |
| | *15:30-17:30* | *Discussion on data collection, data reporting and questionnaire* | *All in plenary* |
| | *17:30* | Daily evaluation | |
| | | | |
| **Day 3**<br><br>*Wednesday, 12 Feb*<br><br>**Group 1** – Field testing of Ex-Act questionnaire and data methodology<br><br>**Group 2 –** Project design and programming | 8:30 – 17:30 | **Group 1** – Field testing of EX-ACT VC questionnaire and data methodology<br><br>**Group 2** – as below | Bobiri forest |
| | 08:30 – 10:30 | Project theory of change /project component | Interactive group work |
| | 10:30 – 11:00 | *Coffee break* | |
| | 11.00 -12.00 | Options of institutional arrangements, overall and by component | Justin |
| | 12:00 – 13:00 | Project Investment Criteria | Rosalie |
| | 13:00-14:00 | Lunch | |

| | | | |
|---|---|---|---|
| | 14:00 – 15:15 | GCF Project Formulation requirements:<br><br>Overall – Environmental and Social Safeguards | Cheikh Sagna |
| | 15:15 – 16:30 | Costing, Financial and Economic Analysis, and use of the FAO's Planning and Budgeting (PB) Tool | Nadim Khouri |
| | 16:30 – 16:45 | *Coffee break* | |
| | 16:45 – 17:30 | Wrap-up | Rosalie/Martin |
| | 17:30 | Daily evaluation | |
| | | | |
| **Day 4**<br><br>*Thursday, 13 Feb*<br><br>*We will be all together (the 2 groups will merge)*<br><br>**2020 Work Programme** | 08:30-10:00 | Debrief/wrap up of the work of each working Groups 1 and 2 and discussion on challenges and lessons learned during field test and work group work | Facilitator<br><br>Nora/Justin |
| | *10:00-10:30* | *Coffee break* | |
| | 11:30-13:00 | Separate Working sessions<br><br>• Seed Group: FORIG/KALRO<br>• Gum group: NGARA<br>• Other NTFPs group: AFF<br>• Other issues : FAO/PAGGW team | |
| | *13:00-14:00* | *Lunch* | |
| | 14:00-15:30 | Separate Working sessions (to be continued)<br><br>• Seed Group: FORIG/KALRO<br>• Gum group: NGARA<br>• Other NTFPs group: AFF<br>• Other issues : FAO/PAGGW team | |
| | 15:30-16.00 | *Coffee break* | |
| | 16:00-17:30 | Status of work carried out so far by regional partners | |
| | 17:30 | Daily evaluation | |
| **Day 5**<br>*Work plan and road map*<br><br>*Friday, 14 Feb*<br>**Wrap up and next steps** | 08.30-10.30 | Developing a work plan and timeline for formulation work including surveys and analysis.<br><br>Review and discussions of overall and individual workplans, reporting requirements, responsibilities to ensure compatibility, feasibility for a first project funding proposal by end 2020. | |
| | *10.30-11.00* | *Coffee break* | |
| | 11.00-13:00 | Continuation | |

| | | | |
|---|---|---|---|
| | *13:00-14:00* | *Lunch* | |
| | 14:00-16:00 | Individual one-on-one sessions to discuss next steps, clarifications, further examples (Ex-Act, PB tool, ESS, etc) | |
| 14 Feb (evening)/15 Feb | | Departure of participants (transfer to airport) | |

**Group 2** = the rest of the SURAGGWA project formulation team

Annex 2: List of Workshop Participants (NGARA Group)

| S/N | Name | Country | Designation | Email Address |
|---|---|---|---|---|
| 1 | HRM Engr Chidume Okoro | Nigeria | Chairman NGARA Executive Board | gacolimited@gmail.com |
| 2 | Dr Ben Chikamai | Kenya | Executive Secretary NGARA | bnchikamai@gmail.com |
| 3 | Dr Fredrick Ojiekpon | Nigeria | National Expert Nigeria | ojiekponif@yahoo.com |
| 4 | Dr Thiam Sakhoudia | Senegal | National Expert Senegal | thiamsak@yahoo.fr |
| 5 | Jonas Diarra | Mali | National Expert Mali | jonaadiarra@yahoo.fr |
| 6 | Patrice Zerbo | Burkina Faso | National Expert Burkina Faso | patzerbogmail.com |
| 7 | Ahmat Haggar | Chad | National Expert Chad | ahthaggar@yahoo.com |
| 8 | Ngethe Rob | Ethiopia | National Expert Chad | robngethe02@yahoo.com |
| 9 | Wubalem Tadesse | | | wubalem16@gmail.com |
| 10 | Maisharou Abdou | Niger | National Expert Niger | maisharou.abdou2015@gmail.com |
| 11 | Simon Dralley | South Sudan | National Expert South Sudan | dralley@gmail.com, simondralley@bjfu.edu.cn |

Annex 3 Proposed Budget for Field Activities

| SN | Key Deliverable/Activities | Amount (USD) |
|---|---|---|
| **A** | **Professional fees** | |
| 1 | Inception report | 1,800 |
| | 1. Draft report of at least 40 pages on key findings from national studies<br>2. Draft 2. 15 pages report on strengthening relevant institutional framework at country level | 3,000 |
| | 1. Final report of at least 40-pages on the task;<br>2. Final report on strengthening relevant institutional framework at country level | 1,200<br>3,000 |
| | **Sub Total** | **6,000** |
| | | |
| **B** | **Reimbursable expenses** | |
| | Locally recruited labour to support sample collection | 192 |
| | In-country travel in Nigeria (payment of fuel) | 2,500 |
| | Boarding and lodging costs of national expert and third party during field visits | 3,500 |
| | **Sub Total** | **6,192** |
| | **Total** | **12,192** |