WASD
WORLD ASSOCIATION FOR SUSTAINABLE DEVELOPMENT

INTERNATIONAL JOURNAL OF GUM ARABIC (IJGA)

IJGA V1 N1/2 2025

DOI: 10.47556/J.IJGA.1.1-2.2025.4

OPEN ACCESS

IJGA **ISSN**
2634-2642 (Print)
2634-2650 (Online)

RESEARCH

Harnessing Gum Arabic to Strengthen Sudan's Trade Bargaining Power, Livelihoods, Peacebuilding, and Green Finance

Dr Idris Musa Adam Omer
Forestry Research Scientist
Director of Regional Tree Seed Centre - ElObeid
Agricultural Research Corporation, ElObeid Research Station, ElObeid, Sudan
Email: idris.musaadam@gmail.com
ORCID: 0000-0002-7741-109X

Dr Hiba Mahmoud Abdelrahman
Forestry Research Scientist
Agricultural Research Corporation, ElObeid Research Station
Email: hibamahmoud@yahoo.com
ORCID: 009-0003-1686-4970

Dr Hatim Abdalla Mohammed ElKhidir
Forestry Research Scientist
Agricultural Research Corporation, ElObeid Research Station
Email: guzaia@hotmail.com
ORCID: 0000-0002-0779-6369

CITATION: Adam, I.M. Abdelrahman, H.M. and ElKhidir, H.A. (2025): Harnessing Gum Arabic to Strengthening Sudan's Trade Bargaining Power, Livelihoods, Peace building, and Green Finance. *International Journal of Gum Arabic (IJGA)*, Vol. 1, Nos 1/2, pp.43-56.

RECEIVED: 2 June 2025 / **REVISED:** 17 June 2025 / **ACCEPTED:** 26 August 2025 / **PUBLISHED:** 30 August 2025

ABSTRACT

PURPOSE: This paper explores how Sudan's absolute advantage in gum arabic can enhance trade bargaining power, improve rural livelihoods, build peace, and promote green finance. It highlights its economic, environmental, and sociocultural significance.

DESIGN/METHODOLOGY/APPROACH: A multidisciplinary approach combines a literature review, policy analysis, and stakeholder insights to examine trade patterns, production capacities, institutional challenges, and financing opportunities.

FINDINGS: Despite supplying over 70% of global gum arabic for decades, Sudan under-utilises its potential due to policy gaps and unsustainable practices. An integrated strategy involving policy reform, capacity building, sustainable management, and innovative finance could maximise its benefits.

ORIGINALITY/VALUE: This paper frames gum arabic as both an economic commodity and a tool for peacebuilding, resilience, and green transition, offering a novel interdisciplinary perspective.

RESEARCH LIMITATIONS/IMPLICATIONS: Based mainly on secondary data, the paper addresses the gap by creating global research on the species.

PRACTICAL IMPLICATIONS: Guides policy-makers, investors, and producers.

KEYWORDS: *Gum Arabic; Senegalia Senegal; Rural Livelihoods; Peacebuilding; Green Finance; Sustainable Development*

INTRODUCTION

Sudan has historically dominated the global gum arabic (GA) market, supplying over 70% of global exports (ITC, 2018; FAO, 2020). Gum arabic, derived mainly from *Senegalia senegal, Senegalia polyacantha, and Vachellia seyal*, is a natural exudate widely used as an emulsifier, stabiliser, and encapsulating agent in the food and beverage, pharmaceutical, cosmetic, and printing industries (Ballal *et al.*, 2005; FAO, 2020). The commodity represents a strategic non-timber forest product (NTFP) with unique physicochemical properties that are not easily substituted by synthetic alternatives, sustaining high global demand (FAO, 2020; Muga *et al.*, 2021).

Beyond its direct economic value, GA production underpins the livelihoods of approximately 5 million rural households residing in Sudan's "gum belt", a zone spanning 13 states and covering nearly 500,000 square kilometres (Hamad *et al.*, 2021). The sector plays a critical role in dryland environmental management through its contributions to soil fertility enhancement, biodiversity conservation, desertification control, and carbon sequestration (Matthew *et al.*, 2009; World Bank Group, 2021; Hassan *et al.*, 2021). Acacia senegal trees improve soil organic matter and nitrogen content, thus benefiting intercropped food crops under traditional agroforestry systems (Ballal *et al.*, 2005; Barbier, 1992).

In addition, GA is embedded in local cultures and social systems, providing traditional safety nets, fostering co-operative institutions, and enhancing social cohesion, especially in conflict-affected regions such as Darfur, South Kordofan, and Blue Nile (Abulgasim, 2024; Hassan *et al.*, 2021). Studies have shown that sustainable gum production can reduce vulnerability to conflict by offering alternative livelihoods, strengthening land tenure security, and encouraging peaceful resource sharing (Matthew *et al.*, 2009; Abulgasim, 2024).

Despite its significance, Sudan's GA sector has not been fully integrated into national development and climate strategies. The country remains largely a raw gum exporter with minimal value addition, missing opportunities for industrial development, technology transfer, and job creation (Ballal *et al.*, 2005; Hamad *et al.*, 2021). Moreover, the environmental services provided by gum gardens, such as carbon sequestration and climate resilience, are not monetised under emerging climate finance mechanisms (World Bank Group, 2021; Hassan *et al.*, 2021). While global interest in sustainable and ethical supply chains is increasing, Sudan's GA sector remains disconnected from digital markets, certified value chains, and carbon credit initiatives (Muga *et al.*, 2021; ITC, 2018).

As Sudan embarks on pathways for post-conflict reconstruction, economic reform, and climate adaptation, GA emerges as a strategic commodity capable of bridging trade development, rural livelihood improvement, peacebuilding, and green finance (Hassan *et al.*, 2021; World Bank Group, 2021). Revitalising and modernising the sector within an integrated policy framework could transform it into a catalyst for inclusive, sustainable growth rooted in Sudan's ecological, cultural, and economic realities.

PROBLEM STATEMENT

Despite its global dominance, Sudan has not fully realised the benefits of its GA sector. Key challenges include:

- **low value addition and export of raw gum,** leading importing countries to capture most industrial, technological, and employment benefits (FAO, 2018);
- **weak bargaining power in trade negotiations,** with Sudan acting as a price taker in buyer-dominated markets (ITC, 2018);
- **limited integration into climate finance,** as ecosystem services such as carbon sequestration remain unmonetised (World Bank, 2020);
- **missed peacebuilding opportunities,** with insufficient use of gum production to support post-conflict recovery (Mohammed *et al.*, 2019).
- **livelihood fragility,** as producers lack access to finance, training, and institutional support (Noble *et al.*, 2015.

GUM ARABIC AND SUDAN'S TRADE BARGAINING POWER

Global Significance of Gum Arabic

Gum arabic has a vital input in food, pharmaceutical, cosmetics, and industrial sectors worldwide. Major importing countries, including the United States (US) and members of the European Union (EU), depend heavily on stable supplies. GA is an energetic natural commodity with deep commercial significance across multiple global industries. Derived mainly from Senegalia senegal and Senegalia polyacantha trees, this exudate gum is respected for its unique functional properties that gives it global significance, including solubility in water, non-toxicity, and excellent emulsifying, stabilising, and binding capabilities.

In the food and beverage sector, GA is extensively used as a stabiliser in soft drinks (particularly in cola formulations), confectionery, bakery products, and flavour encapsulation. It provides texture, prevents sugar crystallisation, and enhances shelf life. In the pharmaceutical industry, it is a key excipient used in tablet binding, coating, and as a carrier in micro-encapsulation technologies. The cosmetics and personal care sector rely on GA as a natural thickener, film-forming agent, and stabiliser in products such as lotions, creams, and hair sprays. The gum is also employed in industrial applications such as lithographic printing, textile finishing, adhesives, paints, and even pyrotechnics. Some Sudanese scientists have said that GA is used in atomic reaction.

Major importing countries, particularly the US, the EU, and Japan, are heavily dependent on reliable supplies of high-quality GA to sustain these industries. The food and beverage giants (e.g., Coca-Cola, Pepsi-Cola, Nestlé, and Mars) rely on uninterrupted GA imports to ensure product consistency. Any disruption in supply, due to geopolitical instability, climate change, or trade restrictions, could have significant downstream effects on manufacturing chains and product availability. As such, GA is classified as a strategic commodity in international trade; its steady supply is important for the industrial and consumer goods sectors in importing nations. This global reliance highlights the importance of GA -producing countries, especially Sudan, contribute more than 70% of the world's GA exports, making it a fundamental player in global supply chains.

OPPORTUNITIES FOR SUDAN TO STRENGTHEN ITS TRADE BARGAINING POSITION

- Forming producer alliances within Africa (e.g., with Chad, Nigeria) to co-ordinate supply, stabilise prices, and improve terms of trade;
- Upgrading value chains through domestic processing to capture greater value through integration with international companies;
- Negotiating preferential trade agreements using the ecological sustainability of GA. Figure 1 shows the top ten exporting countries of gum arabic.

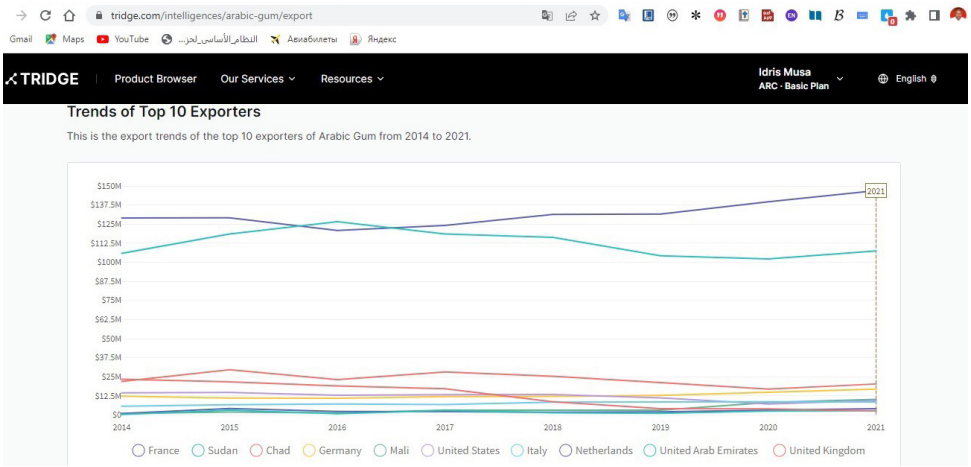

Figure 1: Trends of Top 10 Gum Arabic Exporting Countries

Source: Tridge online reports

Forming Producer Alliances within Africa

Sudan is the world's largest producer of gum arabic, accounting for about 70-80% of global supply. However, it often sells in a buyer-dominated market, with large importing companies or countries (e.g., France, USA, India) dictating prices. To shift this balance, Sudan can forge alliances with other African producing nations, notably Chad, Nigeria, Niger, Senegal, Mali and Cameroon, all of which have significant GA production but face similar market constraints. By co-ordinating policies, these countries can:

- harmonise export standards to ensure uniform quality and reduce undercutting on price;
- control and co-ordinate supply volumes, helping stabilise international prices and reduce vulnerability to demand shocks;
- establish a shared marketing platform to promote African GA as a premium, sustainably sourced commodity.

Models to learn from

The Organization of Petroleum Exporting Countries (OPEC) is an example of how producer nations can collaborate to manage a natural resource for collective benefit. The actions needed are:

- to initiate a dialogue via African Union (AU) platforms or regional economic communities, e.g.:
  - » CEN-SAD – Community of Sahel-Saharan States
  - » ECOWAS – Economic Community of West African States).
- form an intergovernmental gum arabic council to define joint strategies;
- co-ordinate on market supply and demand and international negotiations.

Upgrading Value Chains through Domestic Processing

At present, Sudan exports raw or semi-processed GA; this means most of the added value (and jobs) is captured by foreign processors. Strengthening bargaining power requires moving up the value chain and this should be done by:

- investing in local processing industries through spray drying facilities (to produce powdered GA) (e.g., Babanosa Milk Factory);
- establishment of purification and grading plants (picking tool);
- developing derivatives (e.g., emulsifiers for pharmaceuticals, food stabilisers);
- encouraging private sector participation: provide incentives (tax holidays, access to finance, technical support) for local entrepreneurs to establish processing units;
- fostering partnerships with foreign firms that bring in technology but ensuring that processing happens in Sudan;
- supporting innovation: promote research into novel applications (e.g., biodegradable packaging, dietary fibre supplements);
- linking with universities, local and global research networks;
- higher export earnings per tonne of GA will be real;
- creating skilled and semiskilled jobs.
- reducing dependence on price volatility of raw gum.

Challenges to Address

- Infrastructure (power, transport) to support industrialisation;
- Access to capital and technology, ensuring consistent quality to meet international standards;
- There is some Sudan domestic processing, as shown in Figure 2 and Table 1.

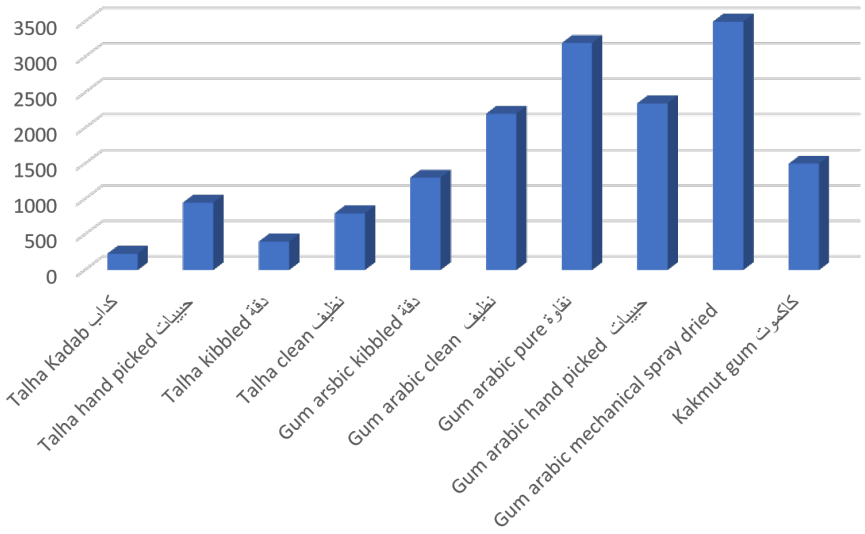

Figure 2: The Gum Arabic Prices ($/Tonne)

Source: Ministry of Commerce, 2025

Table 1: The prices of different gum types

Type of gum	*Price ($/Tonne)*
Talha Kadab (كداب)	230
Talha kibbled (دقة)	400
Talha clean (نظيف)	800
Gum arsbic kibbled (دقة)	1,300
Gum arabic clean (نظيف)	2,200
Gum arabic pure (نقاوة)	3,200
Gum arabic hand-picked (حبيبات)	2,350
Gum arabic mechanical spray dried	3,500
Kakmut gum (كاكموت)	1,500

Source: Ministry of Commerce, 2025

Negotiating Preferential Trade Agreements Using the Ecological Sustainability of Gum Arabic

Gum arabic production is not just an economic activity; it is integral to climate resilience and land restoration. Senegalia senegal and Senegalia polyacantha trees that produce GA, are known to fix nitrogen, improve soil fertility, combat desertification, stabilise fragile ecosystems, serve as carbon sinks, contributing to climate change mitigation. Sudan can use these environmental benefits as a negotiating tool: seeking preferential access or reduced tariffs in markets such as the EU and the US

under sustainability-linked trade schemes is important. Positioning GA exports within frameworks such as the EU's Green Deal carbon border adjustment mechanisms, or the US Trade and Development Agency programmes that promote climate-positive trade, advocate for the inclusion of GA in fair trade or eco-labelling initiatives, helping secure premium prices. The actions needed include mapping and quantifying the environmental services provided by GA production (carbon sequestration, biodiversity), integrating GA into Sudan's Nationally Determined Contributions (NDCs) under the Paris Agreement to strengthen its climate diplomacy leverage, building capacity in trade negotiation specifically around green and ethical trade. The additional strategies to consider are the establishment of a GA commodity exchange in Sudan to provide transparent price discovery and reduce the power of middlemen, digitalising the GA sector (blockchain traceability, e-commerce platforms) to enhance market access and transparency, and promoting co-operative marketing by supporting gum producer associations with training and institutional strengthening.

Enhancing Livelihoods through Gum Arabic

Gum arabic production supports the income of over 5 million Sudanese, mainly smallholder farmers and pastoralists in gum belt states (Kordofan, Darfur, Blue Nile, and others).

Sustainable Production Practices

The promotion of agroforestry systems that combine GA with food crops could be among the points to be considered in addition to investment in research technologies, improved tapping mechanisms - tools of tapping, intensity of tapping, period of tapping and harvesting techniques using high-quality gum through newly developed tools to increase yields (quantitatively and qualitatively).

Community Empowerment

Strengthening co-operatives and producer associations that will provide access to microfinance and extension services tailored to gum producers.

Gum Arabic as a Tool for Peacebuilding

The GA sector spans regions that have experienced prolonged conflict. The promotion of gum production offers alternative livelihoods that reduce dependence on illicit or conflict-related economies. It also offers shared resource management that fosters co-operation between diverse ethnic and tribal groups, and incentives for sustainable land use that mitigate competition over the natural resources considered a key driver of local conflicts.

Mobilising Green Finance through Gum Arabic

Gum arabic production contributes to climate change mitigation via carbon sequestration, as Senegalia senegal trees fix significant amounts of atmospheric carbon and nitrogen in the soil. This combats desertification, while gum gardens stabilise soils and enhance biodiversity.

Green Finance Opportunities

Green finance allows the accessing of carbon markets through certified agroforestry projects and the development of climate bonds linked to GA value chains. In addition, engaging development partners in results-based financing for reforestation and sustainable gum production adds value to green finance.

Comparative Discussion of Findings

The central argument of this paper, that GA could serve as a strategic commodity linking trade, livelihoods, peacebuilding, and green finance, is increasingly supported by empirical and policy-oriented studies.

Trade and Global Significance

As stated by this study, Sudan produces 70-80% of global gum arabic. This aligns with FAO and ITC reports (FAO, 2020; ITC, 2018) that also identify Sudan as a dominant global supplier. However, much of this trade remains buyer-dominated, with major multinational corporations in the Global North (e.g., France and the USA) setting prices and quality standards (ITC, 2018). As found by others, these studies emphasise the need for producer countries to form regional alliances to enhance collective bargaining power, mirroring the OPEC model.

Domestic Value Addition

The advocacy for local value chain upgrading is consistent with findings by Slany *et al.* (2020) that argue that African countries exporting raw agricultural commodities must invest in processing infrastructure to retain more value domestically. Ethiopia's approach to coffee processing and Ghana's policies on cocoa grinding are frequently cited models of how countries can move up the value chain. In Sudan's case, however, constraints such as poor infrastructure, finance access, and limited resources remain key barriers (UNDP, 2021).

Ecological Sustainability and Trade Negotiation

Leveraging the ecological value of gum arabic for preferential trade aligns with the work of Eisa and Elhadi (2022), who explored how climate mitigation co-benefits can strengthen smallholder inclusion in environmental markets. The ecological functions of Senegalia senegal, such as nitrogen fixation and desertification control, also feature in studies such as those by the Food and Agriculture Organization (FAO) (2020) that position gum gardens as natural climate solutions. However, few producer countries have quantified these benefits at scale.

Livelihoods and Community Empowerment

Several studies have confirmed that GA production supports the livelihoods of millions in Sudan's gum belt (Hamad *et al.*, 2021; Ballal *et al.*, 2005). The call for community empowerment through co-operatives and microfinance is echoed in the work of Hassan *et al.* (2021), who found that well-structured producers' organisations improve bargaining power and resilience among gum tappers. However, weak institutional frameworks and donor dependency have often limited the effectiveness of such co-operatives.

Peacebuilding

The framing of gum arabic as a peacebuilding tool is not only relatively novel but supported by growing evidence. Matthew *et al.* (2009) identify natural resource management as a viable entry point for peacebuilding in post-conflict settings. In Sudan, GA production has contributed to shared land use and reduced tensions, especially in parts of Darfur and Kordofan. Similar mechanisms have been used in Colombia's coca-to-cacao transition to provide licit alternatives to conflict economies (IFAD, 2013).

Green Finance

The integration of gum arabic into green finance instruments, such as carbon credits or climate bonds, is gaining traction. Studies by the World Bank Group (2021) and IFAD (2013) suggest that agroforestry projects, if certified under standards such as Verra or Gold Standard, can attract climate finance. This study's suggestion to integrate the absolute advantage of GA into Sudan's Nationally Determined Contributions (NDCs) is forward-looking and aligns with global shifts towards nature-based solutions (NBS) in climate finance frameworks.

CONCLUSIONS

Gum arabic is more than just an export commodity; Sudan has an absolute advantage in producing and exporting GA; aspirations for sustainable development, peace, and economic sovereignty could be achieved by aligning strategies that promote trade competitiveness, inclusive growth, environmental stewardship, and innovative financing. Sudan can harness this unique natural resource to build a more resilient and prosperous future.

POLICY AND INSTITUTIONAL RECOMMENDATIONS

- Revise national gum arabic policies to incentivise domestic processing, quality assurance, and traceability.
- Strengthen gum-producing co-operatives with technical, financial, and organisational support.
- Establish a gum arabic development fund leveraging public-private partnerships, donor funding, and climate finance instruments.
- Promote research and innovation in gum ecology, genetics, and product diversification.
- Caring with the gum producers to give chance for advertencies with gum trees.

ACKNOWLEDGEMENTS

The authors would like to extend their sincere gratitude to Dr Ahmed Mohamed Al-Nour for his invaluable contributions, insightful feedback, and constructive suggestions that significantly enriched the quality of this paper. Due to the journal's editorial circumstances and in order to avoid authorship duplication within the same issue, his contributions have been duly recognised in this acknowledgment section, ensuring that his efforts and intellectual input are fully appreciated and recorded.

REFERENCES

Abulgasim, S.M. (2024): Gum Arabic between Local Negligence and Global Attention: Case study of Kordofan West Sector, Sudan. *Research Review International Journal of Multidisciplinary*, Vol. 9, No. 2, pp.152-168. Available at: https://rrjournals.com/index.php/rrijm/article/view/1083

Ballal, M.E., El Siddig, E.A., Elfadl, M.A. and Luukkanen, O. (2005): Gum arabic yield in differently managed *Acacia senegal* stands in western Sudan. *Agroforestry Systems*, Vol. 63, No. 3, pp.237-245. Available at: https://doi.org/10.1007/s10457-005-4162-x

Barbier, E.B. (1992): Rehabilitating gum arabic systems in Sudan: Economic and environmental implications. *Environmental and Resource Economics*, Vol. 2, pp.341-358. Available at: https://doi.org/10.1007/BF00304966

Eisa, M.A. and Elhadi, H.M. (2022): Review of gum arabic production, Sudan. In Hassan, M.I., Abdelgadir, E.E. and Osman, H.O. (Eds): *Cutting Edge Research in Biology* (Vol. 1, pp.23-32). Book Publisher International. Available at: https://stm.bookpi.org/CERB-V1/article/view/8625

Food and Agriculture Organization of the United Nations (FAO) (2018): *Gum Arabic*. Food and Agriculture Organization of the United Nations. Retrieved from: http://www.fao.org

Food and Agriculture Organization of the United Nations (FAO) (2020): *Gum Arabic: Production, markets and policy options for Sudan*. FAO. Available at: https://www.fao.org/3/ca7478en/CA7478EN.pdf

Hamad, A.A.E.H., El Shifa, A.M., Abdelmagid, T.D., Amien, T.M. and Eltahir, M.E. (2021): Situation analysis of gum arabic production and practices in North Kordofan, Sudan. *Asian Journal of Research in Biosciences*, Vol. 3, No. 3, pp.38-43. Available at: https://journalbioscience.com/index.php/AJORIB/article/view/67

Hassan, M.O., Salih, A.A., Eltahir, M.E.S. and Musa, F.I. (2021): Gum arabic value chain and the share of stakeholders under the applied free-trade policy, Sudan. *Asian Journal of Research and Review in Agriculture*, Vol. 3, No. 2, pp.40-51. Available at: https://www.jagriculture.com/index.php/AJRRA/article/view/33

International Fund for Agricultural Development (IFAD) (2013): *Revitalizing the Sudan Gum Arabic Production and Marketing Project*. IFAD. Available at: https://www.ifad.org/en/w/projects/1100001476

International Trade Centre (ITC) (2018): *Market Access Map: Sudan's trade performance in gum arabic*. ITC. Available at: https://www.intracen.org

Matthew, R.A., Brown, O. and Jensen, D. (2009): *From conflict to peacebuilding: The role of natural resources and the environment*. United Nations Environment Programme (UNEP): UNEP/Earthprint

Mohammed, Y.A., Babiker, I.B. and Ahmed, A.G. (2019): Gum arabic production and livelihoods in conflict-affected areas of Sudan. *Journal of Peacebuilding & Development*, Vol. 14, No. 1, pp.90-105.

Muga, M.O., Chikamai, B.N., Oriwo, V.A., Gachathi, F.N., Mbiru, S.S., Luvanda, A.M., Wekesa, L., Wekesa, C., Omondi, S. and Lelon, J. (2021): Synthesis of the Development in Gums and Resins Sub-Sector in Kenya. *East African Agricultural and Forestry Journal*, Special Issue, pp.154-165. Available at: https://doi.org/10.11648/j.ajaf.20251303.11

Noble, I.R., Huq, S., Anokhin, Y.A., Carmin, J.A., Goudou, D., Lansigan, F.P., Osman-Elasha, B., Villamizar, A., Patt, A., Takeuchi, K. and Chu, E. (2015): Adaptation needs and options. In Field, C.B. and Barros, V.R. (Eds): *Climate Change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp.833-868). Cambridge University Press. Available at: https://doi.org/10.1017/CBO9781107415379.021

Slany, A., Cherel-Robson, M. and Picard, L. (2020): *Economic Development in Africa Report 2020: Tackling illicit financial flows for sustainable development in Africa*. United Nations Conference on Trade and Development (UNCTAD). Available at: https://unctad.org/webflyer/economic-development-africa-report-2020. 56pp

Sudan Ministry of Commerce (2025): *Annual Report*. Ministry of Commerce, Republic of Sudan. Khartoum: Ministry of Commerce.

Tridge website (2025): *Export Market for Gum Arabic*. Available at: https://www.tridge.com/tridge-eye/market-brief/products/gum-arabic/EXPORT_MARKET

United Nations Development Programme (UNDP) (2021): *Sudan country programme evaluation 2018-2021*. UNDP. Available at: https://erc.undp.org/evaluation/evaluations/detail/9719

United Nations Environment Programme (UNEP) (2019): *Sudan: State of Environment and Outlook Report 2020*. United Nations Environment Programme. Available at: https://www.unep.org/resources/report/sudan-first-state-environment-outlook-report-2020

World Bank (2020): *Unlocking the potential of non-timber forest products for climate-smart development*. World Bank Group.

World Bank Group (2021): *Unlocking nature-smart development: An approach paper on biodiversity and ecosystem services*. World Bank. Available at: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/

BIOGRAPHY

Dr Idris Musa Adam Omer is a Sudanese forestry and agricultural expert with over 20 years of experience in research, rural development, and public administration. He holds a PhD in Agriculture (Forestry) with a specialisation in gum-yielding species, particularly Senegalia senegal and Senegalia polyacantha. Dr Idris has served as Director General of State Ministries of Agriculture in North, South and West Kordofan, and currently leads the Sudanese Gums Organization for Rural Development and the Elobeid Regional Seeds Center. As a published researcher and international conference contributor, he is also a recognised climate change co-ordinator under Sudan's National Adaptation Plans (NAP/NAPA). His expertise includes GIS, agroforestry systems, farmer field schools, and sustainable natural resource management. Passionate about building community resilience, Dr Idris integrates science and policy to promote sustainable development and gum arabic sector revitalisation across Sudan's drylands. He is also an expert in statistical analysis and Kobo Toolbox questionnaire designer.

Dr Hiba Mahmoud Abdelrahman is a researcher in Forestry Gum Arabic. Her research focuses on conservation and improvement of Senegalia senegal genetic resources, agroforestry and biodiversity conservation. Professionally, she joined Elobeid Research Station as an agricultural research scientist in the Gum Arabic research programme, engaged in promoting gum arabic tree productivity through a selection of high yielding provenances and development of new improved nursery and management practices. Their recommendations have helped farmers increase gum production yields and sustain productivity of this important export commodity. In addition to her research commitments, she has participated as a resources person in developing agroforestry training modules and extension pamphlets for field days, demonstration farms and extension campaigns. Her experience and input as a team member has also been highly recognised in successfully implemented projects.

Dr Hatim Abdella Mohammed Elkhidir has a BSc in natural resources and environmental studies, Forestry and Range Sciences, University of Kordofan, an MSc in forestry, University of Kordofan, and a PhD in remote sensing, Sudan University of Science and Technology. He has worked as a research scientist in the Agricultural Research Corporation for 20 years. He released technologies that increase gum arabic production by managing the gum tree from seedlings until production age. In addition to doing research in remote sensing focusing on forests and land deduction in the gum arabic belt, he is also excellent in computer sciences and is a GIS specialist.