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# Socio Economic Attributes of Gum arabic Production in Nigeria

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**Abstract:** A fast growing gum arabic economy has stimulated a significant expansion of gum arabic plantations in Nigeria. Presently, Nigeria is second to Sudan in the world production of gum arabic. However, there seems to be dearth of studies on how the socio economic variables of producers affects gum arabic production and expansion in Nigeria. However, this study used survey approach method to examine the socio-economic attributes of gum arabic production in Nigeria. Sixteen States considered to have potential for gum arabic production in Nigeria were visited. Data were collected using structured questionnaires administered to 1184 gum arabic farmers in 15 States using a simple random method. The data were analyzed using descriptive statistics. The results show that 47.4% had no formal education and it was also revealed that 94.8% of farmers' lands were freehold and 10.8% of the farmers had over 20 hectares of land in reserve. The study also revealed that gum arabic production in Nigeria is mainly from the wild as there are 2.45 million hectares of wild grove in forest reserve while 1625 ha and 9766 ha of organized planting were owned by government and private sector respectively. Deliberate efforts should be made to promote gum arabic in marginal land because the crop can survive in adverse climatic conditions and thrive well on marginal soils. Also, it is recommended that the respective State Governments in gum arabic producing States should promote seedling production and distribution to farmers.
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**Keywords:** Gum arabic; production; socio-economic factors; Nigeria.

## 1. Introduction

Gum arabic (*Acacia species*) is a dried exudates from a leguminous trees obtained mainly from the stems and branches of *Acacia senegal* or Acacial seyal. The tree species are well adapted to Sahelian agro-ecological region of Africa. The gum exudates are also obtained from various species of the genus *Acacia.* There are about 1100 spp distributed over tropical and sub-tropical areas of Africa, India, Australia and America. However, only *Acacia senegal* (grade 1) and *Acacia seyal* (grade 2) yield gum of economic significance (Sean 1997; Odo and Oleghe 1998). Acacial species exudes gum normally when the trees are subjected to a stress conditions such as drought or by deliberate wounding of the stem and branches with a sharp object. Idris (2017), reported that the trees must be up to five years old or older for reasonable gum production to occur. Picking of gum exudates from the stem and branches of Acacia trees by famers and rural dwellers serves as a source of revenue in the rural areas and gum arabic plantations also contributes, indirectly to the improvement of the environment in areas threatened by desertification (Sagay and Mesike 2011). It is a drought resistant tree found naturally in arid, sub-tropical and semi-arid climatic zone. The optimum conditions for the growth and performance of the plant are excessive heat, high elevation and sandy soil with scarcity of moisture (Yakassai 1998; Sagay et al. 2007). In Nigeria, the plant grows in areas with rainfall range between 250-1000mm with temperatures between $20^0$C-$4000^0$C. However, Acacia species such as *Acacia dudgeon*, *Acacia gourmmaensis* and *Acacia sieberain* are also found in rainforest area of Osun and Oyo states of Nigeria. In Nigeria, production of gum arabic covers about 250,000 sq km in the entire sahelian region spreading across 12 states namely Borno, Yobe, Jigawa, Bauchi, Adamawa, Kebbi, Gombe, Taraba, Kano, Sokoto, Katsina and Zamfara states. The largest amount of grade 1, is produced in the Borno, Yobe and Jigawa states. In view of its wide production in Nigeria, the country can become the world leading producer and exporter of gum arabic. Presently, gum arabic is propagated by seeds. Nursery activities are seed collection and scarification, preparation of potting mixture in polybags, planting of scarified seeds in polybags, provision of irrigation facility, maintenance, and sale/distribution of seedlings (Omokhafe 2019). Production of gum arabic in Nigeria is largely from the wild but presently several plantations have been established in the growing states of Nigeria. Gum arabic production is exclusively from gum bearing trees and local producers are typically peasant farmers

picking gum exudates as a secondary or complementary source of revenue (Sagay et al. 2007). Improving the production and processing of gum arabic have the potential of generating huge foreign exchange earnings for Nigeria and Africa if its production and processing are optimized.

The commercial use of gum arabic can be traced back to the year 2000 BC, when the Egyptians used it in foods, adhesive and paint industries (Abdul 2002). Gum arabic possessed a unique biochemical structures and properties. It is used as a stabilizer, emulsifier, thickner, carier, bulking and glazing agent, humectant, firming agent and antioxidant (Niranjan et al 2022). The properties of gum arabic makes it essential in food and beverages, cosmetics, pharmaceuticals and printing. Beverages, account for 31.5% of the global market due to clean-label trends (Dayoub 2025). Gum arabic is also used as household remedy in treating various diseases in the sub-saharan African region. According to Al-Jubori *et al* (2023), gum arabic has been found to be effective in treating diarrhea, sickle cell anemia, rheumatoid arthritis, metabolic disorders, periodontitis, gastrointestinal conditions and kidney diseases. Despite the economic importance of gum arabic, Sudan, Nigeria, Chad and Senegal supply over 90% of gum arabic globally. Gum arabic is an important commodity in the international market and it is a crucial source of revenue for producing countries. Apart from providing foreign exchange to developing countries, it also improve rural livelihoods, empower vulnerable group especially women and promote climate change mitigation. Collection of gum arabic in the wild serves as means of combating poverty in rural households and provides insurance against risk and uncertainties. Gum arabic have a good comparative advantage and a relatively higher international competitiveness than other competing cash crops. According to UNCTAD (2018), the exports of unprocessed and semi processed gum arabic have almost tripled for the past 25 years from an average of 35,000 tonnes in 1992-1994 to an average of 102,000 tonnes in 2014-2016. In the period of 2014 to 2016, Sudan accounted for 66% of gum arabic exports, follow by Chad with 13%, and Nigeria with 8.5%. Many African countries exports crude gum arabic at low prices due to low processing capacity and processed gum is re-import at huge prices to meet local manufacturing demand.

Gum arabic is also ecologically important because it improves the soil fertility and it is widely used to control desertification (Raddad and Luukkanen 2013). The tree is therefore potentially suitable for future reforestation in moisture deficient and semi-arid areas.

The world production of gum arabic and contribution by countries are shown in Table 1. Gum arabic is primarily consumed in developing and developed countries. The tapping of gum arabic from the plants is done by wounding the stem deliberately or accidentally. The gum oozes out and ready for collection after 3 – 4 weeks. Subsequent Collections are done bi-weekly two to three times from the same wound (Abdul 2002; Abdullahi 2004). Production of gum arabic in Nigeria is largely from the wild (Oleghe 1998; Abdulahi 2004). However, many efforts are made in the gum arabic growing states in the country to establish gum arabic plantation on a large scale. The demand for gum arabic is on the increase world-wide. Of course, the major determinant of the production of any industrial crop is its demand and the revenue derivable from it. That is, the better the market situation of a crop, the more the desire for higher production among farmers. As gum arabic utilization is expanding globally, the African countries need to engage more in the exportation of processed gum arabic product so as to boost their foreign exchange generation capacities.

Table 1: World Contribution of Gum arabic and Contribution by Countries

| year | Production (Metric Tonnes) | | | | | Percentage of Total | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Sudan** | **Nigeria** | **FWA** | **Others** | **World** | **Sudan** | **Nigeria** | **FWA** | **Other** |
| 1956 | 44.0 | 2.3 | 5.7 | 1.7 | 53.7 | 81.9 | 4.3 | 9.4 | 4.7 |
| 1957 | 46.0 | 2.0 | 5.7 | 1.3 | 55.0 | 83.6 | 3.6 | 10.4 | 2.4 |
| 1958 | 44.0 | 2.7 | 5.7 | 1.3 | 53.7 | 81.9 | 3.7 | 9.4 | 5.0 |
| 1959 | 46.7 | 3.7 | 5.3 | 1.3 | 57.0 | 81.9 | 6.5 | 9.3 | 2.3 |
| 1960 | 47.7 | 4.3 | 5.3 | 1.3 | 58.6 | 81.4 | 7.2 | 9.0 | 2.3 |
| 1961 | 46.3 | 4.3 | 5.7 | 1.0 | 57.3 | 80.8 | 7.0 | 9.9 | 2.3 |
| 1962 | 44.7 | 3.7 | 6.0 | 1.0 | 55.4 | 80.7 | 6.7 | 10.8 | 1.8 |
| 1963 | 46.0 | 3.3 | 5.7 | 1.7 | 56.7 | 81.1 | 5.8 | 8.9 | 4.2 |
| 1964 | 52.7 | 3.3 | 5.3 | 1.7 | 63.0 | 83.7 | 5.2 | 8.4 | 2.7 |
| 1965 | 56.0 | 4.0 | 5.0 | 2.0 | 64.7 | 83.6 | 5.9 | 7.5 | 3.0 |
| 1966 | 53.0 | 4.7 | 6.0 | 3.0 | 65.9 | 81.9 | 7.3 | 9.3 | 1.5 |
| 1967 | 511.3 | 5.3 | 6.3 | 3.7 | 66.3 | 77.8 | 8.0 | 9.6 | 4.6 |
| 1968 | 49.0 | 5.3 | 8.0 | 3.0 | 64.3 | 74.2 | 7.6 | 12.6 | 6.2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1969 | 48.3 | 5.7 | 7.3 | 3.5 | 57.2 | 75.0 | 8.9 | 10.9 | 5.2 |
| 1970 | 39.7 | 6.0 | 8.0 | - | 158.0 | 69.4 | 10.5 | 14.0 | 6.1 |

F.W.A. French West Africa. Source: FDA [13]

Data in Table show that in 2023, France was the world's largest importers of gum arabic in 2023. France accounted for a substantial share of 19.9% of the world imports of $97.3 million, this is follow by USA – 14.9% ($72 million), Germany – 7.84% ($38 million), India – 7.22% ($35 million) and China – 4.39% ($21 million). Nigeria accounted for only 0.01% of total import of 2.7 million of the gum arabic world imports in 2023.

For the export values, France also accounted for a substantial share of 71% of the world exports of $205 million, this is followed by Germany – 7.01% ($20 million), USA – 4.97% ($14.4 million), Italy – 3.02% ($8.74 million), United Kingdom – 2.84% ($8.24 million) and India – 2.75% ($7.97 million) while Nigeria accounted for only 0.72% of total export of $2 million of the gum arabic world exports in 2023.

Table 2: World Exports and Imports of Gum arabic in 2023

| | Exports value (US ) | World share (%) | Imports value | World share (%) |
|---|---|---|---|---|
| France | 205,942,245.81 | 71.13 | 97,301,040.54 | 19.99 |
| Germany | 20,314,824.01 | 7.01 | 38,199,014.55 | 7.84 |
| USA | 14,409,755.00 | 4.97 | 72,689,867.00 | 14.93 |
| Italy | 8,744,872.41 | 3.02 | 17,513,007.24 | 3.59 |
| United Kingdom | 8,242,170.63 | 2.84 | 20,044,657.56 | 4.11 |
| India | 7,975,756.89 | 2.75 | 35,155,846.97 | 7.22 |
| Netherlands | 5,452,661.40 | 1.88 | 6,731,656.21 | 1.38 |
| United Arab Emirates | 2,779,744.38 | 0.96 | 1,436,069.82 | 0.29 |
| Nigeria | 2,090,313.86 | 0.72 | 48,692.52 | 0.01 |

Source: Trend Economy 2024

Odo and Oleghe (1998) reported a diversity of users of gum arabic in the areas of food, and beverage industries, pharmaceuticals, printing and cosmetic industries. Hayward (2014) reported other uses to include the production of charcoal, resin and manufacture of farm and household implements. The world demand for gum arabic is increasing while production in Nigeria is stagnated (Wuranti and Giroh 2005). Considering the high economic potential of gum arabic, the Nigerian government had deliberately attempted to boost its production.

The major problems militating against optimal production and processing of gum arabic in Nigeria include low market margin and efficiency of production, lack of processing facilities, adulteration of grades which results to poor domestic and international prices and poor marketing information. Others include inadequate finance and transportation problems as most rural markets are either not motorable or were in bad conditions. Currently, gum arabic production in Nigeria also faces challenges arising from insecurity in the growing regions, high cost of fencing to prevent trespass by herdsmen, climate change, pests and disease infestations.

To address this challenges, the Rubber Research Institute of Nigeria promotes establishment of plantation of gum arabic in Nigeria through provision of improved gum arabic seedlings to a number of private sector operatives. In addition, the Raw Material Research Council of Nigeria also provide support and capacity building to investors for increased value addition and quality assurance with a view to creating market and employment along the value chain on gum arabic production and processing locally. Considering the importance of gum arabic, this paper therefore seeks to describe the socio-economic factors associated with its production in Nigeria.

## 2. Materials and Methods

Sixteen States considered to have potential for gum arabic production in Nigeria were visited. The States were further grouped into four zones on geographical locations and ease of coverage. The States include:

Zone 1 - Kaduna, Kano, and Jigawa;
Zone 2 - Sokoto, Kebbi, Zamfara and Niger;
Zone 3 - Bauchi. Gombe, Plateau and Nasarawa;
Zone 4 - Taraba, Adamawa, Borno, Yobe

Within these zones, the states were further grouped into medium and low production densities based on the information obtained on intensity of gum arabic activities in the states both in the wild and organized plantings. Four Federal Government Agencies,

including the Rubber Research Institute of Nigeria (RRIN), Forestry Research Institute of Nigeria (FRIN), National Tree Development Unit (NTCDU) and Federal Department of Agriculture (FDA), Abuja were involved in the survey. The agencies worked with a team of officer from each of the relevant States' ministries who were very conversant with the entire survey area and were well acquainted with gum arabic activities in the states. A total of 1184 structured questionnaires were administered to farmers using a simple random method. Simple blocking of States based on density of *Acacia* species either in the wild grove or organized plantations was done to ensure reasonable accuracy of estimates. Descriptive statistics such as frequency distribution tables and percentages were used to analyze the data collected.

**3. Results and Discussion**

Data in Table 3 shows that 47.4% of the respondents did not acquire any form of education while 25% attended Islamic/Quranic schools. This may have affected awareness and subsequent adoption of the production techniques of gum arabic over the years. Although awareness and subsequent adoption were relative, the delivery of the various improved packages to farmers through various extension channels are known to be hampered by poor educational background. Farmers accept innovations with skepticism and hence do not adopt new packages completely from the point of awareness. The result conforms to the findings of Umar *et al* (2013), who found that there was high level of illiteracy among gum arabic merchandise. Data in Table 3 also shows the distribution of the respondents by land holding. About 95% of the farmers' lands were freehold while leasehold and forest reserved constituted 2.1% each. Undefined forms of land ownership constituted the remaining 1.0% in majority of the states, the forest reserved were leased out to farmer for gum production, while in some cases, high proportion of the farmers, about 35.5% had between 1 and 5 hectares of land reserves while 31.2% of the farmer had no plantable reserves. About 12.9 % had between 6 and 10 hectares, 9.75 had between 11 and 20 hectares and 10.8% had over 20 hectares in reserve (Table 3). This suggests that land is not a major constraint to gum arabic production in Nigeria.

Table 3. Educational background, landholdings and plantable reserve

| Educational background | Percentages |
|---|---|
| No. formal education | 47.4 |
| First leaving certificate | 8.8 |
| Secondary school certificate | 4.2 |
| Tertiary education | 9.4 |
| Islamic/Quranic educators | 25.0 |
| Other | 5.2 |
| Total | 100 |
| **Land holdings** | **Percentage** |
| Freehold | 94.8 |
| Lease | 2.1 |
| Forest Reserve | 2.1 |
| Other | 1.0 |
| Total | 100 |
| **Plantable land reserve** | **Percentage** |
| No plantable reserve | 31.2 |
| 1-5 hectare | 35.5 |
| 6-10 hectare | 12.9 |
| 11-20 hectare | 9.7 |
| Above 20 hectare | 10.8 |
| Total | 100 |

Table 4 shows the number of farmers that engaged in the cultivation of *Acacia senegal* in Nigeria. Out of 1,184 farmers that were engaged in gum arabic cultivation, Borno State recorded the highest gum arabic farmers with about 400 farmers. This was closely followed by Yobe State with about 250 farmers while Jigawa and Kano States followed with 120 and 100 farmers respectively. This result shows that Borno and Yobe States have the highest potentials for wild groves and organized cultivation of *Acacia senegal*, as well as being the fore runners in exploitation and marketing of gums. This result also conforms to Yakassai (1998) who reported that over 80% of the total grade 1 gums sold in Nigeria are sourced from Borno

and Yobe States. The results also showed that Nigeria has about 2,460,000 hectares of gum yielding trees that is mainly *Acacia species.* Out of this number, Government owned plantations cover only 1,625 hectares, while 9,766 hectares are of organized private holdings whereas the remaining 2.44 million hectares are in natural forest reserved mostly in Borno, Yobe and Jigawa States. Farmers' participation varied from states to states, which could therefore be traced to the various efforts employed by the Government of the gum arabic producing states to popularize the crop. The disparities among states in organized planting could be traced to the lack of awareness of the economic importance of the plant to farmers and Government Departments in the poor performing States.

Table 4. Organized government and private plantations of *acacia Senegal* and natural stands in Nigeria

| State | Planting years | Government plantings | Private holdings (Ha) | Number of farmers | Forest reserves | Total (Ha) |
|---|---|---|---|---|---|---|
| Jigawa | 1964 – 2001 | 425 | 45 | 120 | 480,000 | 480,470 |
| Borno | 1969 – 2001 | 485 | - | 400 | 584,000 | 583,485 |
| Yobe | 1991 – 2001 | 45 | 9000 | 250 | 540,054 | 554,054 |
| Kano | 1994 – 2001 | 160 | 100 | 100 | 150,000 | 150,260 |
| Kebbi | 1990 – 2001 | 130 | 288 | 60 | 70,000 | 70,418 |
| Sokoto | 1978 – 2001 | 120 | 87 | 38 | 50,000 | 50,209 |
| Zamfara | 1987 – 2001 | 300 | 69 | 11 | 90,000 | 90,367 |
| Adamawa | 1994 – 2001 | - | 94.5 | 100 | 50,000 | 50,094.5 |
| Taraba | 1978 – 2001 | 30 | 17 | 100 | 15,000 | 15,047 |
| Kaduna | 1989 – 2001 | 3.75 | 55 | 5 | 15,000 | 15,058.95 |
| Bauchi | Not available | 50 | 10 | 6 | 256,000 | 256,060 |
| Gombe | Not available | 5 | 26 | 4 | 150,000 | 150,031 |
| | | 1,625.75* | 9766.5* | 1,184 | 2,449,000** | 2,460,392 |

** Average of 625 trees/ha ** Average of 100 trees/ha*

Data in Table 5 shows that 26.4% of farmers got their inputs from the open market, while 24% were from the Government Ministry of Agriculture and Ministry of Environment. On the major areas of expenditure in gum arabic cultivation, 13.6% of the respondents spent most on fencing, 12.7% on transportation, 11.4% on pruning, 2,7% on weeding, 21.4% on seedlings purchase and 37.7% on other areas of expenditure.

Table 5. Mode of sourcing inputs and areas of expenditure in gum arabic production

| Mode of sourcing input | Percentage |
|---|---|
| Freehold | 20.8 |
| Market | 26.4 |
| Ministry | 24.2 |
| Leasing | 11.2 |
| Housing | 7.2 |
| Others | 10.2 |
| Total | 100 |
| **Areas of expenditure** | **Percentage** |
| Fencing | 13.6 |
| Transportation | 12.9 |
| Pruning | 11.4 |
| Weeding | 2.7 |
| Seedlings | 21.4 |
| Others | 37.9 |
| Total | 100 |

Table 6 shows that 44% of the farmers were not have access to extension agents. Some farmers were contacted regularly by extension agents while others were contacted twice a month. The frequency of contacts by Government officials depends on factors like proximity, government interest in gum

arabic farmers, need for assistance and available of transport for such visits. Table 6 also shows that 35% of farmers requested for financial assistance, 17% needed seedlings while 20% needed fencing material. To enable farmers participate in gum arabic cultivation, areas of assistance should include supply of quality seeds, tools and implements, protection materials like fencing wires, effective extension services, organized marketing incentive and strengthening of export promotion and other trade networks.

**Farmers' perceived constraints**: Gum arabic production despite its significant economic and environmental importance, faces numerous constraints that hinders its potentials. These constraints include capital, lack of information, lack of seedlings for planting and others including climate change, overgrazing by nomadic cattle rearers and fire disasters. Table 7 shows that capital was the major constraint to gum arabic cultivation as indicated by 31% of the respondents. This was closely followed by access to information with 20%. Land was not a major constraint to production. Hence with adequate incentives, farmers with large holding will be able to commit more lands to gum arabic cultivation.

**Solution to constraints:** It was also reported by 31% of the respondents that provision of loans would go a long way to solve their problems, while 24% emphasized the need for frequent extension information. Eighteen percent felt that government intervention in entire production process would provide solution to the constraints in the overall production system. Only 5 per cent indicated that provision of land by the various authorities would solve various constraints (Table 7).

Table 6. Contacts with Extension Agents and Areas of Assistance by farmers

| **Rate of visit** | **Percentage** |
|---|---|
| Zero visit | 44 |
| Always | 17 |
| Once per month | 5 |
| Twice per month | 7 |
| Thrice per month | 2 |
| Quarterly | 6 |
| Twice per annum | 18 |
| Total | 100 |
| **Areas of assistance** | **Percentage** |
| Education | 9 |
| Finance | 35 |
| Information | 7 |
| Seedlings supply | 17 |
| Fencing materials | 10 |
| Others | 21 |
| **Total** | **100** |

Table 7. **Major constraints of gum arabic production**

| **Major constraints** | **Percentage** |
|---|---|
| Land | 6 |
| Seedlings | 19 |
| Capital | 31 |
| Information | 20 |
| Market outlet | 9 |
| Others | 15 |
| Total | 100 |
| **Solutions to constraints** | **Percentage** |
| Provision of land | 5 |
| Provision of loan | 31 |
| Extension information | 24 |
| Government involvement | 18 |
| Provision of market outlets | 6 |
| **total** | **100** |

## 4. Conclusion

In conclusion it is apt to note that gum arabic is presently being largely produced from the wild forest of Nigeria as over 2.5 million hectares exist in forest reserved while only 11,391 hectares are in organized plantings across the Sudan and Sahel Savanna regions of the country. Obviously, great potentials still exist for field expansion.

## 5. Recommendations

It is therefore recommended that both the Federal and the respective State Governments in gum arabic production zone of Nigeria should continue to promote the development of gum arabic in the Sudan and Sahel Savanna regions of the country. Also, deliberate efforts should be made to promote gum arabic in marginal land because the crop can survive in adverse climatic conditions and thrive well on marginal soils. Also, it is recommended that the respective State Governments in gum arabic producing States should promote seedling production and distribution to farmers and also promote gum arabic processing to attract higher prices in the international market

## Competing Interest

Authors have declared that no competing interests exist.

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## References

1. Abdul S. Production and commercialization of arabic in Sudan.Available https://A!/commercial production of gum 2002
2. Abdulahi A. Gum arabic; maiden edition. Reports on Survey of Selected Agriculture Raw Material in Nigeria. Published by Raw Materials Research and Development council, Abuja; October, 2004.
3. Al-Jubori Y, Ahmed NTB, Albusaidi R, Madden J, Das, S, Sirasanagandla SR. The efficacy of gun arabic in managing diseases: A systematic review of evidence-based clinical trials .Biomolecules 2023,13(1):138 https://doi.org/10.3390/biom13010138
4. Dayoub M. Trends and Challenges in Gum arabic Markets in Key Producing Countries in Africa (Sudan, Chad, Nigeria and Senegal). MDPI,2025;4(3),16; https://doi.org/10.3390/commodities4030016
5. FDA. Baseline Survey on Gum Arabic. A Report. Federal Department of Agriculture, Abuja; July 2002.
6. Hayward B. Acacia Tree; A sustainable resource for Africa, an overview of Research conducted by oxford Forestry Institute, the Natural Environmental Research Council (NERC) Centre for Ecology and Hydrology and the University of Duncadee 1986 and 2004. Rowes Printers. 2004;366.
7. Idris O.H.M. What is Gum arabic? An Overview. International Journal of Sudan Research, 2017;7(1):1-14.
8. Niranjan P, Nandkishore T, Sharma SC, Shravan K. Gum arabic – A Versatile natural gum: A review on production, processing, properties and applications.2022;187(partA). https//doi.org/10.1016/j.indcrop.2022.115304
9. Odo PE, Oleghe PE. The production and management of gum arabic (*Acacia senegal*) wild in the Sudan and Sahelian zone of Borno state. Journal of Arid Agriculture. 1998;1(2):157–266.
10. Oleghe PE. Production and Management of gum arabic in Sudan and Sahelian zone of Nigeria. Journal of Agriculture. 1998;20:257-266.
11. Omokhafe KO. Climate smart gum arabic crop investment in arid zones: An agroforestry model in Nigeria. Specialty Journal of Geographical and Environmental Science. 2019;3(3):21-34.
12. Raddad EY, Luukkanen O. Dryland rehabilitation with Acacia senegal in the central clay plain of the sudan: implications for ecological sustainability and management interventions. Agricultural Research. 2013;22:31-48.
13. Sagay GA, Igboanugo ABI, Imarhiagbe EO, Mesike CS. Status of gum Arabic exploitation techniques in Nigeria. Conference proceedings, Twenty First Annual National Conference of Farm Management Association of Nigeria held in College of Agricultural Science, Olabisi Onabanjo University. 3rd – 6th Sep 2007;189–192.
14. Sagay GA, Mesike CS. Socio-economic factors associated with gum arabic production in Nigeria. Journal of Social Sciences. 2011;26(1):41-45.
15. Sean G. The Sudan Foundation. An occasional paper published by the Sudan Foundation 212 London WC IV 9 LD UK; 1997.
16. Trend Economy. World Merchandise Exports and Imports by Commodity. 2024;11th November.
17. Umar HY, Otitolaiye JO, Ibitoye SJ. Factors influencing profitability among gum arabic marketers in Jalingo, Taraba state, Nigeria. Report and Opinion 2013;5(8):50-56

18. UNCTAD. Gum arabic Growing Demand means New Opportunities for African Producers. 2018; UNCTAD 16, United Nation Trade and Development.
19. Wuranti V, Giroh DY. Economic Analyses of Gum Arabic production in Yobe state. Nigeria. Journal of Tropical Agriculture. 2005;7(1):56–61
20. Yakassai BA. Marketing of gum arabic in Nigeria. Gum arabic production Workshop, NEARLS, ABU/FDA Abuja 28th – 29th April, APCU. Kano. 1998;11.

3/8/2026