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# Implications of Consecutive Policy Interventions and Measures on Comparative Advantage and Export of Gum Arabic from Sudan

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### Abstract

The paper reviewed the policy interventions and measures that have implications on the gum arabic subsector in Sudan since 1899 to date. Profitability, comparative advantage, competitiveness and economic protection regarding gum arabic commodity were also assessed for the last 15 years, including periods before and after liberalization of gum arabic trade. The study depended on secondary data, which were analyzed by descriptive statistic and policy analysis matrix (PAM). The findings confirmed that gum arabic subsector has experienced different levels of policy interventions and measures for more than one century. These interventions have affected the subsector potentialities, resource base and commodity share on the international trade. Despite that the financial profitability of gum arabic commodity has been encouraging for different stakeholders to engage in the sector commercially, particularly after gum arabic trade liberalization. The economic profitability was far higher than the financial one, assuring the severe burden of direct and implicit taxes on the commodity at local markets, especially during the period of the state owned Gum Arabic Company concession. The commodity proved comparative advantage and competitiveness despite the paradoxical policy interventions and measures. The study suggests some recommendations for policy reform of gum arabic subsector in the Sudan.

## 1. Introduction

Sudan is endowed with huge natural resources in forms of water resources, extensive and mostly uncultivated arable lands, animal wealth, forests, pastures and differing climatic zones. These resources contribute significantly to the population's livelihoods and export portfolio of the country [1]. However, the country is classified by the World Bank as a lower middle income country, in view of that it is frequently experiencing slow and unstable economic growth. The gross domestic product (GDP) is repeatedly in between low and middle class (e.g. 73.82 billion US dollars in 2014), poverty headcount ratio at national poverty lines is relatively high in 2009 (e.g. 14.9% in 2009) and to some

extent similar in recent years (2010-2015). Agriculture (including livestock, crops and forests sectors) was responsible for 26% of GDP, and industry and services contributes 34% and 40%, respectively [1]. Thus, Sudan is the biggest producer of gum arabic worldwide. The contribution of the gum arabic commodity to the national export portfolio of country has been flourishing. The country is considered, directly or indirectly, the main source of gum arabic in the international markets. Some recent studies [2] showed that the contribution of the Sudan to these markets is equivalent to 71%. This statement remains true despite the fact that in recent years France was ranked first as exporter for gum arabic, because France only re-exports and 40% of the gum arabic commodity origin from Sudan [3]. Since long time, the gum arabic commodity has been subjected to various levels of government policy interventions and measures. These exhibit themselves in terms of paradoxical policy interference ([4, 5] such as monopoly, liberalization, oligopoly, instability of producer price setting, high tax rates coupled with duplication and mis-timing of these taxes, overvalued exchange rates, limited bank ceilings pertinent to official credit and unmotivated export policies [6]. Accordingly, main objective of this paper was to understand the effects of the consecutive policy interventions and measures on the comparative advantage, competitiveness and export of gum arabic commodity in Sudan. This was tackled through reviewing different policy interventions and measures that have prevailed throughout the various political institutions in Sudan since 1899 to date, analyzing trends of gum arabic export quantities for the investigated periods (1949-2015), together with the country's share in the gum arabic international trade. Moreover, the study was intended to assess implications of government policy interventions and measures on financial and economic profitability, economic protection expressed by subsidy/tax elements and comparative advantages of the gum arabic local marketing for two periods: 2000 until 2008, and 2009 until 2015. These two periods represent the situations before and after the implementation of gum arabic trade liberalization.. The current paper is also trying to pave the way for a support for

best decisions on future policy reforms in Sudan.

## 2. Materials and Methods

The study deploys principally data from different secondary sources. Quantitative data were listed, compiled reassessed and reanalyzed in view of the paper objectives, illustrating time series for gum arabic quantities, prices, taxes, fees, exchange rates, etc.,. Special attention was devoted to compile gum arabic export volumes (1949-2015) from different sources [25, 26]. Collected data were analyzed using simple statistical analysis and the policy analysis matrix (PAM) as depicted in Appendix A. The PAM, as an empirical technique, was used [7] to estimate the comparative advantage and market competitiveness for the last fifteen years, separated into the two periods before (2000-2008) and after (2009-2015) the gum arabic trade liberalization policy in Sudan.

First, the PAM analysis started with construction of inventory budget tables (IBTs), presented at the end of this paper (Appendix B). This took the form of the familiar farm budget to yield comparative results [7]. Then inputs disaggregation tables for both periods were also constructed (Appendix B). This step was followed by construction of empirical PAM data for gum arabic local marketing activities (Appendix C) before reaching to the complete PAM structure (Appendix D). To enter the budget data into the PAM Model, the quantities of gum arabic commodity and their corresponding unit prices were used for estimation of financial revenues. Second, financial costs were classified into two main categories: domestic resources (land, labor force, capital, etc.) and tradable inputs (cost items that have international equivalent prices (fuel, pesticides, packaging bags, etc.). Then the PAM model's Coefficients (Appendix E) were calculated in forms of equations derived from the schematic PAM structure (Appendix A). This was done to investigate policy intervention effect on gum arabic economic activities under different policy measures and market conditions based on different scientifically reviewed literatures [5, 7, 8, 9, 10] as follows:

### 1. Policy effect on Profitability on the basis of Annex (A):

$$\text{Financial profitability coefficient} = (A-(B+C)=(D)= P^D - (\sum_i p_i^D q_i p_i^D - \sum_j w_j^D I_j^D) = \pi^D \tag{1}$$

$$\text{Economic Profitability coefficient} = E-(F-G)= H = P^S - (\sum_i p_i^S q_i^S - \sum_j w_j^S I_j^S) = \pi^S \tag{2}$$

$$\text{Profitability Coefficient} = PC= (A-B-C) / (E-F-G) = [P^D - (\sum_i p_i^D q_i p_i^D - \sum_j w_j^D I_j^D)] / [P^S - (\sum_i p_i^S q_i^S - \sum_j w_j^S I_j^S)] \tag{3}$$

### 2. Policy effect on trade protection (subsidy/tax elements):

$$\text{Nominal Protection Coefficients} = NPC = NPC = (A/E) = (PD)/(PS) \tag{4}$$

$$\text{Effective Protection Coefficient} = EPC = (A-B)/(E-F) = (P^D - \sum_i p_i^D q_i p_i^D) / (P^S - \sum_i p_i^S q_i^S) \tag{5}$$

### 3. Policy effect on comparative advantage & market competitiveness:

$$\text{Domestic Resource Costs ratio (DRC)} = G / (E-F) = (\sum_j w_j^S I_j^S) / (P^S - \sum_i p_i^S q_i^S) \tag{6}$$

### 3. Results and Discussion

#### 3.1. Reviewing Scenarios of Policy Interventions and Measures on Gum Arabic Subsector

The most important policy interventions, measures and other related socioeconomic tools which affected gum arabic subsector in the country since the beginning of last century to 2015 were compiled from different books, published and unpublished articles and technical reports. This data was categorized according to the timeframe of the different political systems prevailed in the country for more than one hundred years (1899-2015), into four main categories as stated below:

##### A. Anglo-Egyptian and pre-independence era (1899–1956):

- The colonial Anglo-Egyptian authorities [11] established an administration to setup land tenure rules and regulations, and to resolve conflicts on land tenure and land use systems in the country. These rules were largely implemented with the support of the tribal leadership system that prevailed in country at that time [12]. Taxes on land remained the basic form of taxation. The amount of these taxes was estimated depending on the type of irrigation, the number of date palms or productive trees, or the size of herds. The rates of taxation per unit area, tree or animal head were formally determined for the first time in Sudan's history. During that period gum arabic trees were not obviously subjected to taxation, only date palm trees.
- In 1902 the government established the Forests and Woodlands Service and issued the first regulatory act in 1908, revised in 1917, as supportive to the adopted policies of nature conservation [13]. Since the early 1910s, extensive areas of woodlands and forests were converted to agricultural uses [13]. Large amounts of woodlands bearing *Acacia senegal* (*hashab*), *Acacia seyal* (*talha*) and other trees and were cleared for the establishment of large-scale mechanized irrigated and rain-fed farming schemes in Gazira and central states (e.g. Gazira Scheme was initiated firstly as experimental farm for cotton cultivation in 1911 and officially started as a main agricultural project in the country in 1925). These policies were considered as the main reasons for eradication of *hashab* stands in Gazira area, which remains till yet out of the gum belt boarders in the Sudan. Kordofan region was excluded from these measures because there were no tangible or large scale mechanized projects in the area at that time [14, 13]. Conversely, the marketing of gum arabic as cash crop started to gain its importance after construction of Elobeid crops market in middle part of the city in 1905 [15]. The market moved to its current location near the rail station at Elobeid in 1912. This market is considered as the biggest market for gum

arabic commodity worldwide [14, 5].

- In 1920, the colonial authorities decided to regulate the gum arabic trade from Sudan by allowing the traders, most of them were foreign companies [16], to export their gum arabic commodity for the first time officially from *Suakin* exit-port in Red Sea State. The island town of *Suakin* served as a gateway for gum arabic trade to East African and Arab countries [12]. This was considered as a real kick-off the gum arabic international trade from Sudan.
  - In 1922, the colonial authorities introduced the auctioning systems coupled with the producer floor price [17, 5] for the first time for gum arabic marketing at some potential markets in the country (Elobeid and Umdurman crops markets). These policies were intended to push up the producers prices and to protect them through auctioning from the exploitation of middlemen and traders. This policy didn't achieve its stated objectives because most of the companies at that time were oligopolistic companies seeking profit maximization [15]. Also, the majority of these companies were foreign companies and had no interest in rising the producers' prices or livelihoods [16].
  - In 1932, the colonial authorities issued and declared the first National Forest Policy in the country. The policy reined for more than half a century and was amended 1986. This policy emphasized the importance of gum tree and gum trade as core issues for development of the forest sector, particularly to help in poverty reduction in rural areas of Sudan. According to literature [15, 18], the statement of Forest Policy 1932 reads: '*In gum areas it should be the object of province to maintain the existing stock in a healthy condition, and by control of markets, by improvement of communications and by sowing, to encourage the exploitation of new area*'. Although this amended policy aimed at conservation and improvement of the gum arabic resource base, however, it didn't result in satisfactory outcomes [6].
- ##### B. Independence, *Abboud* regime and early democracy period (1956-69):
- In the period from 1959 to 1962, the conditions were favorable for gum arabic production and trade. Comparatively, there was economic, social and ecological stability; gum production was benefited from such environment to a considerable degree of stability. The supply was able to keep pace with increase in world demand [4].
  - In 1962, the producer floor price was declared for the second time as a policy to support gum arabic producers. The Ministry of Commerce, Industry and Mining took the responsibility of organizing the gum market to avoid the fluctuations of prices and the decline in its export proceeds. It was noted that auction markets did not exist in any producing area

[15, 16]. However, the producer floor price policy attempted to activate and improve the interplay of supply and demand for gum arabic in local markets. The floor price was not protected by any commercial means as purchasing the producer commodity surplus and no intervention was allowed. Accordingly, two observations were made. First, there were acute fluctuations in gum prices and second there was decrease in the revenues of gum arabic exports. This formula, however, was not very effective in preserving the minimum prices fixed by specialized committee and announced by the Ministry of Commerce. Prices were still dropping to levels below the fixed minimum ones as gum piles at the end of the auction day and no one was ready to take the surplus at the formal prices.

- In 1966, a Concentration Fund was imposed by the Federal Ministry of Commerce for rehabilitation of gum arabic production areas for improving infrastructures and services. An amount of 0.2 Sudanese pound (later raised to 0.25 pound) per *kantar* (1 metric ton (MT) = 22.26 *kantar*) was charged and collected by the local councils at a service fee of 10% of the total amount. This fund was intended to be a concentration and stabilizing fund. Despite this attempt, however, the problems continued to exist. According to some telling arguments [16], the main problems, which could not be solved by the concentration fund, were: Firstly, there was no real effective protection (organization or mechanism) to protect the producers from strong companies most of which were branches or agents to foreign companies that they had no interest in preserving such protection. Secondly, trading companies were unconstructively competing in the international markets as a result of which there was a continuous decrease in the foreign currency export proceeds coming to Sudan. The average inflow of gum arabic export proceeds never exceed US \$12 million for the period 1960-1969 despite the fact that the average total annual amount exports never fell below 45 thousand tons. Thirdly, there was no body concerned with or taking care of supervision, follow up or quality control issues. This resulted in a number of complaints from foreign importers of gum arabic about the quality of gum quality. Fourthly, there was lack of coordination among the stakeholders in the areas of production and environment as well as the beneficiaries from trading in gum arabic.

#### C. Nimiery regime, transitional period and second democracy (1969- 1989):

In 1969, a government-sponsored joint-stock company (Gum Arabic Company, GAC) was established and given the exclusive concession (monopoly) for exporting crude gum arabic from the Sudan [4, 14]. The company is public listed and owned by about five thousands Sudanese shareholders, including Sudanese Ministry of Finance,

owning 28% of the GAC's capital, and the gum arabic producers' union owning around 8%, but the representatives of the union are four members out of eleven in the GAC board members [19]. Thus, GAC is the sole exporter of crude gum arabic from Sudan and the world price dominant supplier in this respect. Accordingly, the GAC as a model for marketing gum arabic used some mechanisms to regulate gum trade [19, 4, 6]:

- GAC was mandated by its main objectives to be responsible for the protection of gum arabic producers in the country through preserving a minimum price (floor) for them.
- It was also authorized to supervise and promote the international marketing of gum with the objective of increasing its exports revenue.
- It was endorsing to preserve the quality control and protects the reputation of Sudan by working closely with the concerned official entities.
- GAC is supposed to take care of the environment and gum communities by various ways and through coordination with the concerned government authorities.
- In 1976, the government authorities decided to give more attention to gum arabic producers through involvement of their union in GAC administration board for the first time [19]. The idea was raised and supported by the Sudanese Socialist Union, the sole political party that governed the country for about sixteen years. Evaluation of the gum arabic cooperative associations [20] in Sudan during that period proved that no tangible outcome was achieved for gum arabic producers and other stakeholders.
- In 1987 the price of the gum arabic was increased to its maximum level by the minister of the Foreign Trade due to the drought and the small amount of the puffer stock owned by GAC. This situation led the importers as general and the processors in particular to think loudly about gum substitute industry as well as supporting producing countries other than Sudan. The result of such threat also the redefinition of gum arabic which it comes later in this paper [17, 2].

#### D. Al-Bashir (*Ingaz*) regime (1989-2016):

The recent period of *Ingaz* regime has experienced very strong involvement of the government in gum arabic sub-sector in general and Gum Arabic Company (GAC) management in particular: the board of the Gum Arabic Company is chaired by the Under Secretary of the Ministry of Trade, and comprises the General Manager of the National Forest Corporation, the Governor of the Central Bank of Sudan, in addition to four representatives of the Sudan Farmers Union [6]. More efforts were devoted to production and export of *talha* gum (from *Acacia seyal*). Nevertheless, *talha* gum has a nutritional value, to some extent, similar to *hashab*. The exclusive power of GAC as a sole exporter over raw gum arabic was affect after the modification of investment law that allow investors and/or land owners with

more than 5000 feddans (around 2000 hectares) planted with *Acacia* trees to export processed gum arabic [5]. This was theoretically issued although in practice most the exports use the chance to export either/ both processed and raw gums [6]. The most important policy interventions and measures could be summarized with the following points:

- In 1990/91, GAC concession on gum arabic trade was dismantled. During this short period, traders and banks bought gum arabic from auction markets, domestic demand was high, and producers received a high share of export prices [17, 4].
- At the end of 1991, the exclusive GAC concession was reintroduced [5, 6].
- In 1992, the National Assembly issued the overall liberalization policies in the country. In view of that the exchange rate was liberalized and the export taxes were abolished. Despite that gum arabic was exempted from these policies and the concession of GAC continued [6].
- In 1992-1994, real emerging of gum arabic substitutes as a result of the acute increase in gum arabic world prices made by the Ministry of Trade in Sudan [4, 5]. The export gum arabic price/ton was increased from about US\$ 2000 to US\$ 4500. Accordingly, part of international demand of gum arabic was shifted to the gum arabic substitutes (e.g. synthetic starch and gelatine).
- In November 1997, the United States of America issued an economic embargo (sanctions) on Sudan for its alleged sponsorship of international terrorism. Accordingly, the trade between American and Sudanese companies was generally prohibited. Concerned about the lack of alternative sources, major newspapers, pharmaceutical firms, and beverage giants such as Coca-Cola lobbied intensively the Clinton administration for the gum arabic to be exempted from these sanctions. They worked tirelessly and successfully to convince the U.S. State Department and Treasury Department that the embargo unfairly punishes a significant number of U.S. companies who process and use gum arabic without having any effect on total Sudan gum arabic exports. Their arguments swayed US Congress, and imports of gum arabic were exempted from those sanctions. The exemption was again renewed in the Tariff Suspension and Trade Act of 2000 (§1464, Pub L. No. 106-476), signed by President Clinton on November 9, 2000. In that act, the Congress also authorized the President to promote the development of alternative sources in countries other than Sudan [21].
- In 1999, the redefinition of gum arabic by the 31<sup>st</sup> Codex Committee for Food Additives, held at the Hague, Holland, from 19–23 March 1999, as the dried exudate from the trunks and branches of *Acacia senegal* or *Vachellia (Acacia) seyal* in the family *Leguminosae (Fabaceae)* such definition was put Sudan in a challenge to maintain its competitiveness in terms of quality and prices [2].
- In 2000, debates and arguments for and against liberalization of gum arabic trade were raised again. The advocates of liberalization measure argued that the favourable gum arabic export earnings never ever trickled down to the producers' level [17].
- In 2002, a presidential decree was passed to abolish the concession from GAC with the objective to allow more firms to trade in raw gum arabic in order to revive gum production. Three months later, the National Assembly refused to endorse this decree [6].
- In 2003, the Ministry of Investment endorsed about 12 gum arabic processing companies, which considered as a turning point that has led to reduce GAC concession [6, 5].
- In 2005, a Cabinet Decree (No. 118 on 3<sup>rd</sup> of Sept.) on abolishment of GAC concession on gum arabic trade was passed [6].
- In 2005/06, the *Mansoor Khalid* comprehensive report on gum arabic was requesting the National Assembly to give more attention to the gum arabic trade. This report represents a diagnostic *policy vision under the title Crisis of Gum Arabic and Gum Arabic Companies: Rescue and Reform Measures* [22].
- In August 2006, the Minister of Foreign Trade in Sudan signed a ministerial order (No 7/2006), whereby the licences offered to the gum arabic processing companies (in 2003) were abolished and GAC processing units were exempted from this order [6]. The order was based on some arguments that, those companies used to export semi-processed gum arabic rather than fully processed one. It was considered as obvious violation to the gum arabic export exemption regulations.
- In September 2006, one month later, the economic committee, belonging to the National Assembly, refused to endorse this regulation, and returned the licences once again to the gum arabic processing companies [6].
- In 2006/07, a comprehensive policy report was conducted by *Elkindi* National Committee on gum arabic trade. Accordingly, the liberalization measures of gum arabic trade were strongly encouraged [5].
- In 2008, the consequences of the global financial crisis on gum arabic trade were very acute. In view of that, Sudan's share in the gum arabic world market was sharply declined. Appearance of some collusive arrangements in international transactions of gum arabic from Sudan as "Sale under Consignment" [23, 5].
- On the 4<sup>th</sup> of June 2009, President Al-Bashir issued a "Republican decree ending the monopoly rights held by the Gum Arabic Company on production, trade and export of the gum arabic commodity and endorsed liberalization measures" [5]. The Ministry of Finance and National Economy has also reduced most of the

taxes on gum arabic commodity at production and marketing sites. In the same year (2009), the Gum Arabic Board (GAB) has been initiated by a Presidential Decree to act as a regulatory body for coordinating the gum arabic developmental and commercial efforts. GAB is performing its activities through four technical committees to address gum arabic production, local marketing, sector policies, processing, quality aspects, promotion and advertisement and research activities.

- In 2014, a dispute on gum arabic definition started. Gum arabic was defined by the 3<sup>1st</sup> Codex Committee for Food Additives, held at the Hague, Holland, from 19–23 March 1999, as the dried exudates from the trunks and branches of *Acacia senegal* or *Acacia seyal* [24]. Sudan provided some scientific arguments to restrict the definition of gum arabic to *Acacia senegal* gum only. This was mainly raised because this Sudanese side believe that the physiochemical prosperities and uses the gums obtained from the two species (*Acacia senegal*, *Acacia seyal*) are totally different and the International Codex Committee for Food Additives is trying to destruct the Sudanese comparative advantage and international competitiveness on *Acacia senegal* gum. These arguments were not accepted by the international Codex Committee.
- In 2015, the Sudanese Standardization of gum arabic commodity has been endorsed by a Cabinet Decree issued in early 2016. Based on these measures the quality aspect of gum arabic export will receive very high attention by local stakeholders from upper to downstream levels and the related institutions (Forest National Corporation {FNC}, Gum Arabic Board {GAB}, urban and central crops markets and gum arabic developmental projects). However, as the

number of exporting companies is increasing year for year since the complete liberalization of gum arabic exporting has commenced, and reaches now more than 200 companies [2]; the issue of quality is questionable as GAB has no power to enforce its directives to such companies. The issue of quality led the Association of International Promotion of Gums (AIPG) to establish a code for gum quality aspects to be restrictedly followed by all producing and processing companies and institutions members under the umbrella AIPG. This came as a result of exporting gums mixed by groundnuts and has been detected in USA in the final product.

### 3.2. Gum Arabic Export (1949-2015)

The flow of gum arabic exported quantities from Sudan to the world during the investigated periods (1949-2015) showed generally an unstable zigzagging pattern, expressing itself in a relatively trending downward at moderate rate (Figure 1). The average annual exported quantities revealed a relatively declined trend throughout the four investigated periods. It reached the maximum (77,914 tons) during the pre-independence period, diminished to about two third (49,314 tons) through the post-independence period, and declined slightly (47,154 tons) once again in the period extended from Nimiery regime to the second democracy. The lowest average annual exported quantity (only 24,619 ton) of the commodity was apparent in the first nineteen years of *Ingaz* regime (1989-2008), during the last period of GAC concession. After the declaration of the gum arabic trade liberalization a policy, the average annual exported quantities was extremely increased (49,801 tons). Recently, this annual export quantity reached about 62.500 tons (2015).

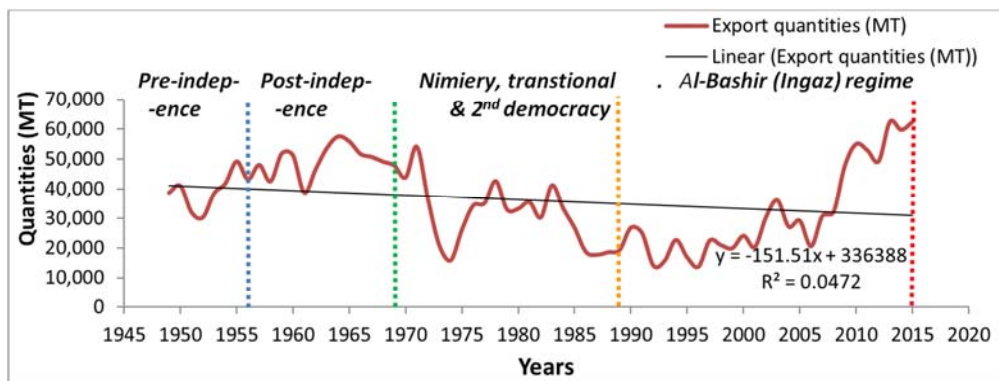


Figure 1. Export quantities of Sudanese gum arabic to the international markets (1949-2015) (Data compiled from different official reports [25, 26])

The percentage share of Sudan to the international gum arabic market showed also an unstable zigzagging pattern represented by a downward trend at a relatively higher rate (Figure 2) compared to the trend of the exported quantities. The average share was higher (78% and 82%) during the first (1949-1955) and the second (1956-1968) investigated periods, and then slightly declined (72%) in the third periods (1969-

1988). The period extended from 1989 till the abolition of GAC concession has experienced extremely sharp decline (34%) in the international share of the Sudanese gum arabic. Most recently, after the liberalization measures (2010-2015) this share has vigorously increased (71%), although the country has not yet recovered its position as a sole exporter of gum arabic commodity to the world market.



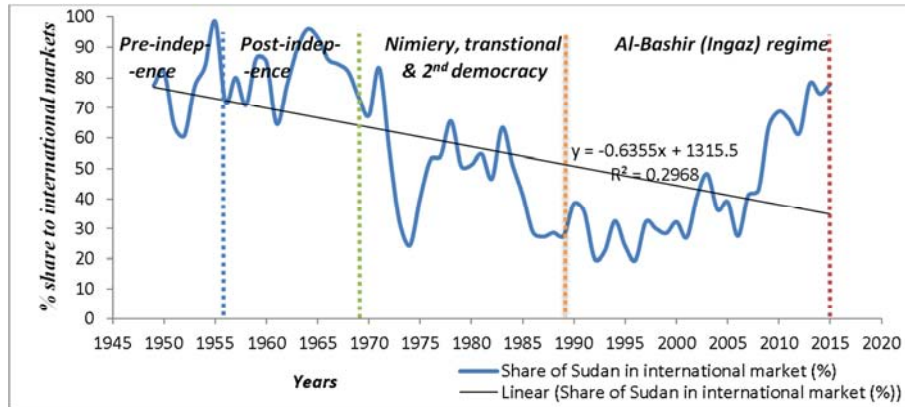


Figure 2. Percentage share of Sudanese gum arabic to international markets (1949-2015) (Data compiled from different official reports [25, 26]).

The overall effect of these policies together with some socioeconomically and environmental factors on gum arabic export quantities during the investigated periods could be summarized as follows:

The high quantities of gum export during the early period's pre and post-independence (1950s and 1960s) were attributed to the followings:

- Favourable environmental conditions prevailed across the gum belt at that time [27].
- Involvement of large segments of rural population in gum arabic production due to limited sources of income [28]. It was seen that the gum arabic commodity is contributing positively to Sudan GDP beside cotton and sesame during this period.
- Imposition of low and favourable tax rates because the major policy focus was devoted to land tenure regulations than taxes and government revenue issues [4].
- Less competition in gum arabic trade between Sudan and other neighbouring countries [16].
- Low export prices that favouring the importation of gum arabic from Sudan which clearly reflecting in high exporting quantities and low total earnings.
- Deterioration of gum arabic supply quantities to world market was at maximum during the first preceding period of Nimiery regime (1970-1975) followed by relatively high quantities during the second half of 1970s before declining once again in the early 1980s. This was generally ascribed to the Sahel drought of the 1970s and 1980s, which has led to a southward shifts in gum arabic production [15]. It has moved the land use practices from a rotation with long fallow periods (15–20 years) of gum cultivation combined with short period of cultivation (4–6 years) towards a more or less continuous cultivation [29].

Looking broadly to the consecutive policy interventions and measures throughout the investigated periods showed that gum price policies and trade measures received much attention by policy makers and concerned institutions in the country than other gum arabic dimensions such as production, natural resource base, infrastructures, innovations

and technology transfers, extension services and information systems. The price setting of the gum arabic commodity at market was historically dependent on the minimum floor price which was mainly determined by the Federal Ministry of Commerce, whereby the producers were allegedly to be protected because the floor price was considered to be the starting price for gum arabic bidding. This policy gained success occasionally and experienced failure sometimes. Many traders preferentially sell their gum arabic commodity outside the auction markets due to many factors including lower rates of taxes and fees imposed on crops, lesser bureaucracy and routine resulting in high profit margins obtained at these markets. According to the current price liberalization policies, the minimum floor price is no longer valid. This situation most likely has led to price dimness among gum arabic traders prior entering the market or the auction hall. Accordingly, the gum arabic market nature could be described as in between competitive and oligopoly. The official governmental perception towards the development of gum arabic marketing system in country has always been driven by export-led vision, while the development of gum arabic marketing has been verified and found depending largely on the local markets (rural traditional, urban and auction markets).

### 3.3. Gum Arabic Quality Standards and Processing Policies

Sudan, with its long standing history and culture in natural gum production continues to maintain its worldwide leadership position in the production of gum arabic. The country's leadership covers several aspects of this product including organized plantation, production volume, quality control, research, sector organization, training and value added processing [30].

Specifications for identity and purity of gum arabic were prepared by FAO, based on the American Food Chemical Codex specifications and an "ADI not specified was except by good manufacturing practice" [31]. In 1973 these specifications were revised without change [32].

In 1978 the joint FAO/WHO Expert Committee on Food additives (JECFA) issued the first specifications for gum

arabic [33], and has been reviewed every 4 years (1982, 1986) without any significant changes. In 1990, two major changes were introduced such as the addition of numerical limits for specific rotation and nitrogen content, these limits closely resembled those of *A. senegal var. senegal* and excluded other gums such as *Acacia seyal* [34]. However specifications were revised again in 1995, JECFA excluding the most important distinguishing parameters of specific rotation and nitrogen content and introduce -the words- "closely related species", since *Acacia A. seyal var. seyal* and *var. fustula* is botanically different from *A. senegal var. senegal* it was not accepted as closely related species to *A. senegal var. senegal*. In 1997 *A. seyal var. seyal* and *var. fustula* was accepted as closely related species and specific rotation limits expressed only as laevorotatory and dextrorotatory for *A. seyal var. seyal* and *var. fustula* and *A. senegal var. senegal* respectively [35].

In 1998, the *Codex Alimentarius* meeting prepared, due to objections from Sudan a proposed specification for gum arabic, which was sent to JECFA for further consideration. Sudan had strong objections against including *A. seyal var. seyal* and *var. fustula* gum in the specification of gum arabic. This led to another recommendation for the specification of gum arabic, where *A. seyal* was accepted as gum arabic, but gum from other *Acacia* species were excluded from the specification.

In March 1999 the Codex Committee for Food Additives and Contaminants gave acceptance to the specification in category 11 (recommended for adoption after editorial changes, including technical revisions). Those editorial changes include:

The deletion of the synonyms gum *hashab*, and *talha*.

The deletion of the sentence "gum from other *Acacia* species, is not included".

The deletion of the sentences "referring to immunological differentiation and technological inters- changeability". This proposal was accepted and sent to *Codex Alimentarius* Commission at its 23 session in Rome in July 1999. The approved specification defines gum arabic (E414) as: The dried exudation obtained from the stems and branches of *A. senegal* (L) or *A. seyal* (Fam. Leguminosae).

Despite that fact this specifications lead to increasing the amount of gum *talha* in the export portfolio and reached to 70% compared to *hashab* gums [2]. However, the producing countries are not allowed to mix *hashab* and *talha* and they have to follow restrictedly the following:

- Gum quality and traceability
- Labels, plots, and other identification techniques
- Intermixing grades and gum values are prohibited and classified as bad practice
- Keeping gum clean and safe

Accordingly the processors have the right to blend and sell the blended products under the code of E414. This situation led to many arguments in the producing countries, especially in Sudan, that they are asking for separation of the two gums into different codes.

Nevertheless quality control measures in Sudan include a

small laboratory at the cleaning and sorting warehouses in Port Sudan. Samples of gum are regularly checked and each export consignment receives a certificate giving analytical data such as moisture content, acid-insoluble matter and optical rotation [30].

Until the last few years, it was impossible for any other organization to export gum arabic out of Sudan because a concession was maintained by the Gum Arabic Company Ltd. Only the last ten years has witnessed a continued change in the global market trend for gum arabic both from the supply and demand ends of the market divide. The result was that the Government of Sudan between 1996 and 2004 licensed ten companies to buy gum arabic freely in Sudan, but export it in only processed form. The grades of the processed gums as identified by the Ministry of Industry as spray dried powder gum, mechanical powder gums and kibbled gums.

More than ten companies have installed gum processing plants in Sudan; most of them installed kibbled gums lines only, and three mechanical powder lines. One company installed spray dried powder line in a partnership with a German processing company.

The aim of this policy is to grant overseas processors more direct access to raw gum arabic of Sudan's origin, break the concession of GAC, and to introduce competition in the local market for gum arabic, to enhance market efficiency. The processing companies are not very successful and this failure might be attributed to the following reasons:

- The difficulty of marketing processed gum arabic in international markets due to lack of trust and high competition.
- The conspiracy and market power of existing international processors.
- The high capital intensive nature of gum arabic processing.
- The Sudanese exporters did not make use of the liberalization policies and they restricted their exports to raw gum only.

### 3.4. Interpretation of PAM Results

A. Financial and economic profitabilities of gum arabic commodity:

The results of financial profitability (Appendix D) showed that the gum arabic local marketing activity is profitable and efficient for the participating market partners. The stakeholders during the first investigated period (during GAC concession from 2000 to 2008) gained less financial profitability (SDG 418.62) per ton compared to the subsequent period (2008-2016) of gum arabic trade liberalization policies (SDG 677.53). The positive financial profitabilities in both cases could be attributed to fact that gum arabic production and local marketing activities use fewer amounts of tradable inputs compared to domestic resources which, in turn, reduce the effects of government distorting policies. Also, the domestic resources are always obtained at low financial costs.

The economic analysis (Appendix B), done in the absence



of policy interventions and market failures effects, highlighted that the higher economic profitability (SDG 1459) was achieved after implementation of gum arabic trade liberalization policies (2009-2015). The ongoing results revealed less economic profitability (SDG 2096) for gum arabic local marketing during GAC concession (2000-2008). In both cases, the economic profitabilities for the two investigated periods of gum arabic local marketing were far higher than the financial ones. It denotes the severe burden of the direct tax rates imposed during the GAC concession periods besides the implicit tax burden created by the overvalued exchange rate during the second period of gum arabic trade liberalization on the revenue levels. Comparing the results of the two instigated periods emphasizes the crucial role of the producer price as a major source of policy divergence during the GAC concession period. Therefore, the producer floor price was argued to structure the market prices till the abolition of GAC concession by the presidential decree (2009). In addition to that, the existence of GAC concession power, reflected by the high negative values of the output transfers (equivalent to SDG -2925.6 and SDG -1704.18 during and after GAC concession periods, respectively) in gum local marketing, widens the gap between the financial and economic prices and, hence, pushing down the proceeds of gum arabic local marketing to levels much less than what should prevail if market price of the commodity was calculated on the light of world market.

B. Economic protection provided to gum arabic local marketing:

The nominal protection coefficient for outputs (NPC) and the effective protection coefficient (EPC) for both outputs and tradable inputs were used to estimate the degree of the economic protection provided to gum arabic local marketing activity in Sudan for the two investigated periods. By calculating both NPC and EPC (Appendix E), the study determined both the implied subsidy/tax elements and the divergence between incentives that were generated by policy and incentives that were provided in the absences of policy intervention effects. The two investigated periods (before after abolition of GAS concession), highlighted that the gum arabic local marketing activity was taxed in two ways. The value of the NPC for the gum arabic local marketing during concession show that the gum arabic commodity was severely taxed (directly and/or implicitly), since the NPC value was reported to be far less than one (NPC = 0.48 indicates that about 52% of the final commodity price was deducted as taxes). The EPC coefficient (0.41) for the same period during GAS concession showed relatively higher tax rate equivalent to 59% on both final gum arabic commodity and its tradable inputs. According to [4], the direct taxes have been extensively imposed during GAC concession and came under different categories namely; business profit tax, production tax, *Jihad* tax, *Jareeh* tax, *Ushur* and *Gibbana* tax, and alms (*Zakat*). The implicit taxes were evolved as a result of overvalued exchange rate, which was reported to be more during the recent period after abolition of GAC concession.

C. Comparative advantage and competitiveness of gum arabic commodity:

In the Ricardian models, the comparative advantage is defined as the ability of the country to produce a good at lower cost, relative to other goods, compared to another country [7]. Empirically, comparative advantage and international competitiveness of a commodity could be calculated with the PAM model using DRC coefficient as expressed within the methodological aspects of this paper.

The PAM results showed that gum arabic local marketing activity posed a reasonable comparative advantage during the first period of GAC concession (2000-2008) and to lesser degree after the implementation of ongoing liberalization period (2009-2015), in view of that the DRC ratios for the two periods were found to be 0.71 and 0.83, respectively (Appendix E). A DRC ratio less than one indicates that the financial values of domestic resources in both periods (SDG 1703.03 and SDG3656.4) are less than their corresponding economic values (SDG9679.9 and SDG10019), respectively. This is mainly because that gum arabic production and local marketing activities use huge amounts of domestic resources and very few amounts of tradable inputs which lead to a some extent reasonable international value added in the first period (2000-2008) and low comparative advantage in the second period (2009-2015).

## 4. Conclusions

The findings of the study confirmed that gum arabic subsector in Sudan has experienced different levels of government policy interventions and measures since more than one hundred years (1899-2015). These have affected the subsector potentialities, resource base and the country share to the international gum arabic trade. The PAM analysis revealed that gum arabic local marketing activity is financially profitable and efficient for the concerned stakeholders to perform, particularly during the recent period of the gum arabic trade liberalization. The economic profitabilities for the two investigated periods were found to be far higher than the financial ones, assuring the severe burden of direct and implicit taxes on the gum arabic commodity with less economic protection, especially during period of GAC concession. Furthermore, the gum arabic commodity still has a reasonable comparative advantage and competitiveness (decreasing if compared to the past) despite the consecutive government policy interventions. Based on these results, the study suggested some recommendations for policy reform of gum arabic subsector in the country:

- Most of the reviewed policies and measures pertinent to gum arabic subsector in Sudan have tackle extensively GAC power (monopoly, concession and trade liberalization measures), commodity price setting (producers floor price, export prices) and government revenues (taxes, fees and local duties) as core issues for most of the government policy intervention in Sudan. To correct for that, pushing the government perception towards improving gum arabic resource base,

infrastructure and services in Sudan is of a paramount import for any policy reform in the future.

- Re-organization of gum arabic producers' associations to play a major role in gum arabic policy setting.
- The gum arabic trade policies in Sudan should be driven towards being export-led oriented policies, in order to reduce the policy divergence and gaps between the financial and economic prices and hence pushing up the incomes of local stakeholders to levels much better than what have prevailed throughout the investigated periods.

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## Appendices

### Appendix A: Schematic Policy Analysis Matrix (PAM)

	Revenue	Tradable Inputs	Domestic Resources	Profit
Financial prices	A	B	C	D
Economic prices	E	F	G	H
Transfers (Policy effect)	I	J	K	L

Source [10]

### Appendix B: Inventory Budget Tables (IBTs) & Input Disaggregation Tables (IDTs)

1) IBT for gum arabic local marketing activities:				
Description	Average 2000-2008		Average 2009-2015	
	Financial prices in SDG/ton	Economic prices in SDG/ton	Financial prices SDG/ton	Economic prices in SDG/ton
Total revenue (based on average auction prices)	2739.4	5665	11002.83	12707
Transportation and handling costs to auction market	882.5	687	922	740
Storage costs in local markets	281	355	755	655
Cleaning, drying, sorting costs	180	300	689	455
Average purchased price (paid to producer)	1002.73	2278	7731	8011
Taxes, regional fees and alms ( <i>Zakat</i> ).	489	0	890	0
Market commissions & other fees.	101	586	440	750
2) IDT for gum arabic local marketing activities:				
1. Transportation/handling cost to market:	882.5	687	922	740
Tradable (70%)	617.75	549.6	645.4	592
Domestic resources (20%)	176.5	137.4	184.4	148
Transfers (10%)	88.25	0	92.2	0
2. Cost of storage:	281	355	755	655
Domestic resources (90%)	252.9	355	679.5	655
Transfers	28.1	0	75.5	0
3. Manual cost of kibbling, cleaning, sorting, grading...etc.):	180	300	689	455
Domestic resources (100%)	180	300	689	455
4. Average purchase price:	1002.73	2278	7731	8011
Domestic resources (100%)	1002.73	2278	7731	8011
5. Taxes, fees, customs and <i>Zakat</i> :	489	0	890	0
Transfers (100%)	489	0	890	0
6. Market commissions ( <i>Umulat</i> ) & other fees.	101	586	440	750
Domestic resource (90%)	90.9	586	396	750
Transfers (16%)	10.1	0	44	0

### Appendix C: Empirical PAM Data for Gum Arabic Local Marketing Activities

	Average 2000-2008		Average 2009-2015	
	Market prices in SDG/ton	Economic prices in SDG/ton	Market prices in SDG/ton	Economic prices in SDG/ton
Total revenue	2739.4	5665	11002.83	12707
Total tradable inputs	617.75	549.6	645.4	592
Total domestic factors costs	1703.03	3656.4	9679.9	10019
Total transfer	615.45	0	1101.7	0

**Appendix D: Complete PAM Structure for Gum Arabic Local Marketing Activities**

1. PAM for the period (2000-2008):				
	Revenue (SDG/ton)	Tradable inputs in SDG/ton	Domestic resources in SDG/ton	Profitability in SDG/ton
Financial prices	2739.4	617.75	1703.03	418.62
Economic prices	5665	549.6	3656.4	1459
Transfers	-2925.6	68.15	-1953.37	-1040.38
2. PAM for the period (2009-2015):				
	Revenue (SDG/ton)	Tradable inputs in SDG/ton	Domestic resources in SDG/ton	Profitability in SDG/ton
Financial prices	11002.83	645.4	9679.9	677.525
Economic prices	12707	592	10019	2096
Transfers	-1704.18	53.4	-339.1	-1418.48

**Appendix E: Coefficients of PAM for Gum Arabic Local Marketing Activities**

Coefficients of policy analysis matrix (PAM)	Annul average (2000-2008)	Annul average (2009-2015)
Average shadow Exchange Rate (SER)	US\$ 1 = SDG 2.64	US\$ 1 = SDG 6.26
Financial profitability ( FP)	SDG 418.62	SDG 677.53
Economic profitability (EP)	SDG 1459	SDG 2096
Profitability coefficient (PC)	0.29	0.32
Nominal Protection Coefficient (NPC)	0.48	0.87
Effective Protection Coefficient (EPC)	0.41	0.85
Domestic Resource Cost (DRC)	0.71	0.83

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