

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

**UNCTAD**



# COMMODITIES AT A GLANCE

Special issue on gum arabic

No. 8



UNITED NATIONS

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## NOTES

Reference to “dollars”, or use of the dollar symbol (\$), signifies United States dollars, unless otherwise specified.

The term “tons” refers to metric tons.

Unless otherwise stated, all prices in this report are in nominal terms.

Data sources are indicated under each table and figure.

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## ACRONYMS

<b>AAGR</b>	average annual growth rate
<b>ASI</b>	Achats Service International (Niger)
<b>CAS</b>	cleaned amber and sifted
<b>CEXPRO</b>	Compagnie Commerciale pour l'Exportation des Produits (Cameroon)
<b>CFA</b>	Financial Cooperation in Central Africa
<b>CFAF</b>	CFA franc
<b>CIF</b>	cost, insurance and freight
<b>CNI</b>	Colloïdes Naturels International (France)
<b>DFQF</b>	duty free and quota free
<b>EUV</b>	export unit value
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FNC</b>	Forests National Corporation (Sudan)
<b>FOB</b>	free on board
<b>GAC</b>	Gum Arabic Company (Sudan)
<b>GAU</b>	Gum Arabic Union (Sudan)
<b>GEF</b>	Global Environmental Fund
<b>HPS</b>	handpicked select
<b>HS</b>	Harmonized Commodity Description and Coding System
<b>IFAD</b>	International Fund for Agricultural Development
<b>INDC</b>	Intended Nationally Determined Contribution
<b>INS</b>	International Numbering System for Food Additives
<b>JECFA</b>	Joint FAO-WHO Expert Committee on Food Additives
<b>LDC</b>	least developed country
<b>MFN</b>	most favoured nation
<b>NAPA</b>	National Adaptation Programme of Action
<b>ROW</b>	rest of the world
<b>SDG</b>	Sudanese pound
<b>SOMIEX</b>	Société Malienne d'Importation et Exportation (Mali)
<b>SONIMEX</b>	Société Nationale d'Importation et d'Exportation (Mauritania)
<b>WHO</b>	World Health Organization

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# CHAPTER I

## INTRODUCTION

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Gum arabic is a dried exudate obtained from the stems and branches of certain species from the *Acacia* genus.<sup>1</sup> Given its many desirable properties, safety record and natural origin, it is the most commercially valuable exudate gum, with wide applications in industries as diverse as food and beverages, pharmaceuticals, cosmetics, printing, ceramics, photosensitive chemicals, pyrotechnics, textiles, paper, ink, paints and adhesives. Produced primarily in arid wooded savannas in sub-Saharan Africa, but also in smaller quantities in South Asia and the Arabian Peninsula, gum arabic is consumed predominantly by manufacturers in developed and emerging economies. Exports of crude and semi-processed gum arabic almost tripled in the last 25 years, from an annual average of 35,000 tons in 1992–1994 to an annual average of 102,000 tons in 2014–2016. In addition, exports of processed gum arabic more than tripled, from 17,000 tons to 53,000 tons in the same period. Export revenues reached an estimated average of \$337 million per year in 2014–2016, 44 per cent of which accrued to crude and semi-processed gum and 56 per cent to processed gum. Overcoming the uneven distribution of economic gains along the value chain by increasing local processing and ensuring higher compensation for resource-poor gum collectors are among the main challenges faced by producing countries.

Due to its potential to generate foreign exchange reserves, ensure food security, promote sustainable agriculture and forestry, and combat desertification and climate change, gum arabic is a promising commodity for a number of sub-Saharan African countries. It has the potential of playing a critical role in producer countries' efforts to achieve the Sustainable Development Goals set forth in the 2030

<sup>1</sup> The ownership of the Latin genus name *Acacia* has been the object of one of the longest-running debates in the history of botanical nomenclature. When the botanist George Bentham defined the modern *Acacia* genus in the 1840s, he named it after *Acacia nilotica*, a widely-known Afro-Asiatic species described by Linnaeus in 1753. Subsequently, the genus expanded to over 1,300 species with morphological similarities to Afro-Asiatic acacias, of which approximately 1,000 were native to Australia. Increased demand by botanists to split the large cosmopolitan genus into monophyletic genera culminated in a controversial decision, at the 2005 International Botanical Congress, to reserve the name *Acacia* for a new genus composed of Australian species and adopt new names for the non-Australian genera. This decision generated an unprecedented amount of public indignation because the normal application of the rules of priority would instead have kept the name *Acacia* for a subset of species native to Africa, Asia and the Americas (Kull and Rangan, 2012). The current report adopts the pre-2005 nomenclature, according to which both Australian and non-Australian species belong to the *Acacia* genus.

Agenda for Sustainable Development. This issue of the *Commodities at a Glance* series explores the economic, social and environmental relevance of the gum arabic sector, with a focus on supply, demand, prices and market organization. Its aim is to present information in a clear, concise and reader-friendly format. In particular, the report makes an important contribution by constructing a comprehensive and improved dataset on crude and processed gum arabic trade flows.

This special issue on gum arabic is organized in six chapters. The remainder of the current introductory chapter reviews the history, regulatory status, geographical distribution, ecological characteristics and biochemical properties and functions of gum arabic. Chapter II discusses traditional uses and modern industrial applications. Chapter III describes the gum arabic value chain, with a focus on the main agents at different stages of transformation. Chapter IV examines global supply and demand for crude and processed gum arabic. Chapter V analyses the evolution of gum arabic prices over time and across countries and product types. Chapter VI presents policy recommendations and concludes the report.

## A. HISTORICAL OVERVIEW

Recorded use of gum arabic dates back to 2000 B.C., when ancient Egyptians employed it in foodstuffs, hieroglyphic paints and mummification ointments. Its properties were discussed in Theophrastus's *Historia Plantarum* and Pliny's *Historia Naturalis*, two of the most important natural history treatises written in classical antiquity. Gum arabic was also used in mural paintings in early Christian catacombs and in manuscript illumination and medical treatments in medieval Europe and the Middle East. At the time, European traders classified gums into geographical varieties, to which commercial value was attributed based on their purity levels. The term "gum arabic" was ascribed to high-quality African gum imported from Arab ports, such as Alexandria and Jeddah. As the Ottoman Empire controlled these ports in the Late Middle Ages, the product was once commonly known as "Turkey gum". By contrast, the term "East Indian gum" referred to gum that was imported into Mumbai from Red Sea ports, mixed with inferior quality local gums, and re-exported.

European maritime expansion put an end to the gum monopoly exerted by Turkish-Arab ports. In the second half of the fifteenth century, Portuguese traders moved

up the Senegal and Gambia rivers, exchanging cloth and hardware for gum arabic, gold and slaves. As the centre of gravity of European trade shifted from the Mediterranean Sea to the Atlantic Ocean, the “Gum Coast” of present-day Mauritania and Senegal became virtually the sole commercial supplier of gum arabic to Europe.<sup>2</sup> Competition between European powers for control of the gum trade led to the so-called “Gum Wars” in the eighteenth century. Gum arabic was the only agricultural or arboreal commodity that was exported from West Africa to Europe in substantial quantities prior to the abolition of the Atlantic slave trade in the nineteenth century.

The Industrial Revolution stimulated European demand for gum arabic – which was indispensable in the production of textiles, paper, ink and cosmetics – and bolstered commercial opportunities for the gum-producing region in the upper Nile river valley, in the present-day Sudan. Control of the lucrative gum arabic trade was one factor that motivated the Egyptian invasion of the Sudan in 1820. The Egyptians imposed a monopoly on gum arabic marketing and provided export concessions to a small number of European merchants. Mounting international pressure led Egypt to liberalize gum arabic trade in 1842–1843 and again in 1849. By the early twentieth century, the Anglo-Egyptian Sudan replaced Senegal as the most important world supplier. Concomitantly, France and Great Britain reinforced their position as leaders in the processing and re-exporting of gum arabic.

The thriving Sudanese gum arabic trade aroused interest in British administrators in the Protectorate of Nigeria, where large stretches of land covered in acacia trees remained economically unexploited due to lack of expertise in gum collection and marketing. Early efforts by British firms to export gum arabic from Nigeria were not met with success, as improper sorting and grading resulted in low-quality gum that commanded unprofitable prices in Europe. After studying the organization of gum arabic production in the Sudan and the sorting and grading practices in the transshipment ports of Bordeaux and Trieste, the British established a steady gum trade between Nigeria and Europe in the 1930s. European colonialism was also behind the development of a modern gum industry in the Horn of Africa. During the 1940s, Italian colonial authorities introduced organized tapping and harvesting of natural gums on a commercial scale in

<sup>2</sup> The gum arabic exported through European trading posts in the Gum Coast originated from the Sahelian zones of present-day Mali, Mauritania and Senegal.

Somalia and Eritrea, from where it spread to Ethiopia. The commercial potential of gum arabic in most other sub-Saharan African countries remained largely untapped until cultivation began in Chad in the 1950s.

The prolonged drought in the Sahel in 1968–1975, the shorter drought in 1983–1985 and intermittent political unrest resulted in substantial setbacks to gum trade. As acacia forests and plantations were decimated, production and exports dropped sharply and stocks were depleted. Exports revived at a slow pace in the 1980s and 1990s, despite the return of normal rainfall levels, since part of the pre-existing demand in developed countries switched to substitutes during the periods of short supply. Unfavourable domestic policies, such as excessive taxation and marketing and export monopolies, further reduced producer prices and discouraged production in a number of African countries.

Market liberalization, rising demand from emerging markets and the advent of new commercial applications, such as in nutraceutical and pharmacological products, improved the sector’s prospects in the new millennium. High producer prices in 2005 pushed world crude gum arabic exports beyond 70,000 tons for the first time since the early 1970s. Trade volumes more than doubled within 15 years, from 50,000 tons in the early 2000s to 113,000 tons in 2016. Since the opening of Africa’s first gum arabic spray drying<sup>3</sup> facilities in Nigeria and the Sudan in the late 1990s and early 2000s, countries that once exported only crude and semi-processed gums are now gradually entering the market for higher value added processed gums, which is dominated by firms from developed countries. Recent developments in gum arabic supply, demand and prices are discussed in detail in chapters IV and V.

## B. REGULATORY STATUS

The term “gum arabic” may be used with varying degrees of restrictiveness. In its broadest sense, it encompasses dried exudates from the *Acacia*, *Albizia* and *Combretum* genera. Another broad conception comprises gums from all *Acacia* species, but excludes

<sup>3</sup> Spray drying is an advanced method of processing liquid feeds into customized formulations. It consists of three stages: (i) atomization, when droplets are formed; (ii) drying, when liquids are evaporated through exposure to gas; and (iii) powder recovery, when dried particles and gas are separated. The method is widely applied in the production of flavour, encapsulated fragrance, pharmaceutical, cosmetic, light industrial and animal feed products.

gums from other genera. More restricted definitions of gum arabic may refer to gums produced by *Acacia senegal* and a subset of related *Acacia* species, or even to gums produced exclusively by *Acacia senegal*.

In the context of food additives, an internationally-accepted and unambiguous definition of gum arabic was first established in 1969 by the Joint FAO-WHO Expert Committee on Food Additives (JECFA), an international scientific expert committee administered jointly by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). Since then, JECFA has been the competent authority on the subject, periodically re-evaluating and updating the international definition and standard characteristics. International definitions for food additives arise from the need to ensure that their ingestion is not associated with health hazards. Products that comply with JECFA specifications have been tested and shown to be safe for human consumption. The latest specification, published in 1999, defines gum arabic as “a dried exudation obtained from the stems and branches of *Acacia senegal* (L.) Willdenow or *Acacia seyal* (fam. *Leguminosae*)”, and lists a number of identification and purity characteristics, such as solubility, constituents, ash content, lead content and loss on drying.

As the JECFA specification has important market implications, it has been the subject of heated international debate. By determining the types of gum that can be labelled as gum arabic for food additive purposes, the JECFA characterization provides incentives to producers of specific species. The breadth of the definition has fluctuated significantly over time. In 1986, JECFA defined gum arabic as “a dried exudation obtained from the stems and branches of *Acacia senegal* (L.) Willdenow or related species of *Acacia* (Family *Leguminosae*)”. Since the specification did not provide details on what constituted a “related species”, more than one thousand *Acacia* species and subspecies could potentially be identified as sources of gum arabic. In 1990, JECFA adopted a new specification with three explicit criteria: (i) gum arabic should originate from *Acacia senegal* or “closely related species”, (ii) its optical rotation<sup>4</sup> should be between minus 26 and minus 34 degrees, and (iii) its nitrogen content should be between 0.27 per cent and 0.39 per cent. These

<sup>4</sup> Optical rotation is the angle through which the plane of polarized light is turned after passing through an optically active substance.

parameters were seemingly selected to ensure that only gum from *Acacia senegal* (and closely related species) could qualify as gum arabic (Coppen, 1995). However, in 1995, JECFA dropped the optical rotation and nitrogen content requirements, as they had the unintended effect of excluding gums from certain types of *Acacia senegal*.<sup>5</sup> Finally, JECFA replaced the reference to “closely related species” with a direct reference to *Acacia seyal* in 1998, and republished the specification in 1999 to include editorial changes. The inclusion of a direct reference to *Acacia seyal* was supported by countries with extensive populations of this species, such as Chad and Nigeria, and opposed by the Sudan, where gum was produced mostly from *Acacia senegal*.

Although the definition of gum arabic for food additive purposes has remained unchanged since 1998–1999, the issue continues to generate disagreement among gum-producing countries. In 2016, the Sudan put forward a proposal at JECFA to divide gum arabic into two subclasses based on the botanical sources of natural gum extracts, for which separate safety evaluations would be necessary. Burkina Faso, Chad, Eritrea, Ethiopia, Kenya, the Niger, Nigeria, Senegal and South Sudan sustain that there is no technical or scientific evidence to justify having more than one specification for the botanical sources currently classified as gum arabic (Codex Alimentarius Commission, 2016). For purposes of this issue of the *Commodities at a Glance* series, the term “gum arabic” is defined as in the 1999 JECFA specification. Unless otherwise stated, references to gum arabic are understood to encompass gums obtained from both *Acacia senegal* and *Acacia seyal*. Gums obtained from other *Acacia* species or from other genera are not covered in this report. The choice of the JECFA definition in the current report is appropriate, given that the majority of the gum arabic traded internationally is used in the food and beverages sectors and must, therefore, comply with stricter food additive specifications.

The use of the JECFA definition of gum arabic implies that gums that may be marketed as gum arabic, but which do not originate from *Acacia senegal* or *Acacia seyal*, are not analysed in this report. This includes, for example, gums originating from *Acacia karroo*

<sup>5</sup> For example, according to the JECFA specification in effect between 1990 and 1995, Kenyan gum originating from *Acacia senegal* of the *kerensis* variety did not qualify as gum arabic, as it fell outside the established limits for optical rotation and nitrogen content (Jurasek et al., 1993).

in Southern Africa or *Acacia polyacantha* in Benin, Côte d'Ivoire, Ghana and Togo (Chikamai, 1998). Other *Acacia* species from which lower quality gums are collected include *Acacia dudgeoni*, *Acacia laeta*, *Acacia nilotica*, *Acacia paoli* and *Acacia sieberana* (ITC, 1978; Coppen, 1995; Muller and Wata, 1998).

In addition to the JECFA specifications, FAO and WHO established a harmonized naming system for food additives known as the International Numbering System for Food Additives (INS). In this system, gum arabic is identified by the code INS 414. Australia, the Cooperation Council for the Arab States of the Gulf, the European Union, Iceland, Israel, New Zealand, Norway, South Africa and Switzerland have adopted national food additive numbering systems that generally correspond to the INS. On packaging, approved food additives are written with a prefix E in the European Union, Iceland, Norway and Switzerland (i.e. E414) and without a prefix in Australia and New Zealand (i.e. 414). Canada, Japan and the United States of America are among the countries that do not use INS codes on packaging.

Some countries and regional blocks also publish their own definitions of gum arabic, which may differ from the JECFA specification. For example, the European Union, Japan and the United States take a broader view of gum arabic in their food additives regulations, since they consider it to include dried exudations obtained from *Acacia senegal* or related species of *Acacia* ("closely related species" in the case of the European Union). Other national and regional regulations have also influenced global supply and demand. In the United States, the characterization of gum arabic as "generally recognized as safe" (GRAS) in 1961 and its affirmation for direct use in foodstuffs in 1974 increased its appeal to users. The European Union decision to grant gum arabic the official food ingredient status in 2008 also improved its marketability, as hitherto it was only allowed to be marketed as a food additive.

### C. GEOGRAPHICAL DISTRIBUTION AND ECOLOGICAL CHARACTERISTICS

The principal area of geographical distribution of *Acacia senegal* and *Acacia seyal*, the two internationally recognized botanical sources of gum arabic, is the so-called gum belt of Africa: the vast arid wooded savannas that span sub-Saharan Africa, from Mauritania and Senegal, in the west, to the Sudan, Eritrea, Somalia, Kenya and the United Republic of

Tanzania, in the east. The two *Acacia* species are also found in Oman, Pakistan (provinces of Baluchistan and Sindh) and India (States of Gujarat, Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh).<sup>6</sup>

*Acacia senegal* grows best in deep, sandy and well-drained soils, in areas with average precipitation between 200 and 500 mm per year and a bioclimate of the warm subdesert type (i.e. dry season of 9–11 months per year). However, the species is also found in poorly drained soils (such as light sandy-clay soils, brown clays or clay sandstones), in areas receiving up to 800 mm of rain per year and a bioclimate of the dry tropical type (i.e. dry season of 8 months per year) (ITC, 1978).

*Acacia seyal* thrives in clay, sandy-clay and sandy soils that are often flooded in the winter time. It grows frequently on alluvial plains and previously cultivated grounds. From the climatic point of view, it is found in areas with isohyets ranging between 200 and 1000 mm per year and bioclimates ranging from the warm subdesert type to the strongly tropical type (i.e. dry season of 7–8 months per year) (ITC, 1978).

The presence of trees from the *Acacia senegal* or *Acacia seyal* species in a given region is a necessary, albeit insufficient, condition for gum arabic production. *Acacia* forests may remain commercially unexploited due to the lack of production and marketing skills, capital shortfalls, poor infrastructure, and civil and political unrest, among other reasons.

Due to encroaching desertification, a southward shift in the natural distribution of *Acacia senegal* and *Acacia seyal* has been observed in recent decades. If soil overexploitation and climate change are left unchecked, this shift is projected to continue. Paradoxically, planting acacia trees in large tracks of land can be used to prevent desert encroachment and even reclaim desert land. In 2007, the African Union launched the Great Green Wall project, a pan-African effort to battle desertification and tackle poverty and land degradation across the Sahel region by planting trees and creating economic opportunities for the local population. As part of this initiative, the World Bank and the Global Environmental Fund (GEF) are supporting the Government of Mauritania as it fights

<sup>6</sup> Some sources stipulate that gum arabic-yielding species were introduced to Australia, Egypt, Puerto Rico and the Virgin Islands. However, Liogier and Martorell (2000) contend that the species known as "gum arabic tree" in the Caribbean is in fact *Acacia nilotica*, a species that is not included in the JECFA definition of gum arabic.



desertification by regenerating acacia trees and expanding gum arabic production.<sup>7</sup>

Since *Acacia senegal* and *Acacia seyal* trees fix nitrogen to the soil, they contribute to climate change mitigation and adaptation by increasing soil fertility, plant coverage and crop yields. For example, in the Sudan, acacia cultivation is often rotated with crop cultivation: aging acacia gardens are cleared for the cultivation of sorghum, sesame, millet or groundnuts; when crop yields decline, fields are abandoned for adjacent locations; abandoned plots are then recolonized by acacia trees, which increase soil fertility in preparation for a new cycle of crop cultivation.

In the context of the United Nations Framework Convention on Climate Change, the Governments of four gum arabic producing countries – Ethiopia, Senegal, South Sudan and the Sudan – included the rehabilitation of acacia woodlands and the establishment of acacia nurseries as priority activities within their National Adaptation Programmes of Action (NAPA). Furthermore, the Governments of four gum arabic producing countries – Mali, the Niger, Somalia and the Sudan – included explicit references to the planting and rehabilitation of acacia gardens in their Intended Nationally Determined Contributions (INDC).

In certain regions of the African gum belt, practices at the micro level reflect the goals set by national authorities. For example, in the Bara district of North Kordofan State, in the Sudan, 42.9 per cent of sampled households in 2014 expanded *Acacia senegal* plantations as an adaptation strategy to combat climate change and improve crop yields (Khalifa et al., 2016). Other strategies used in the region include the formation of gum arabic producer associations and the adoption of communal forests, reported by respectively 18.6 per cent and 10 per cent of respondents. In the gum producing regions of the Niger, the restocking and planting of valuable trees (including acacia trees) and the protection of acacia seedlings were the second and third most widely adopted climate change coping strategies, cited by 15.6 per cent and 14.7 per cent of respondents, respectively (Djibo et al., 2016).

<sup>7</sup> Initiated in 2016, the World Bank-GEF project is expected to promote sustainable landscape management techniques, enhance access to commercial markets and enable the development of a sustainable gum arabic value chain in 39 communes in the regions of Brakna, Gorgol and Trarza, in southern Mauritania.

## D. BIOCHEMICAL STRUCTURE AND FUNCTIONS

Gum arabic is a complex composite of glycoproteins, polysaccharides and salts that takes the form of solid spheroidal tears of varying size. The gum obtained from *Acacia senegal* ranges in colour from pale white to orange-brown and possesses a matt surface texture. When processed to the broken or kibbled state, it acquires a paler and glassy appearance. The gum from *Acacia seyal* is darker and more brittle than the hard tears obtained from *Acacia senegal*. Other commercially available forms of gum arabic include white to yellowish-white flakes, granules and roller-dried or spray-dried powders. Unlike most natural gums, gum arabic dissolves well in water and does not interact with other chemical compounds. It is also odourless, tasteless and translucent. For marketing purposes, *Acacia senegal* gum is designated as hard gum, whereas *Acacia seyal* gum is referred to as friable gum. In the Sudan, these two types of gum arabic are commonly known as *hashab* and *talha*, respectively.

The chemical composition of gum arabic may vary with botanical source, tree age, climatic conditions and soil environment (Dauqan and Abdullah, 2013). Studies have shown that there is genetic variability among the *Acacia senegal* genotypes growing in Africa, particularly across the four recognized varieties: *Acacia senegal* var. *senegal*, *Acacia senegal* var. *kerensis*, *Acacia senegal* var. *leirhochis*, and *Acacia senegal* var. *rostrata* (Mokwunye and Aghughu, 2010). Nevertheless, the principal polysaccharide is found to be arabic acid, a polymeric carbohydrate molecule linking a D-galactose with branches composed of L-arabinose, L-rhamnose and D-glucuronic acids; proteins are essentially arabinogalactans; and the major amino acids are hydroxyproline, serine, proline and aspartic acid (Badreldin et al., 2008).

Gum arabic has two highly desirable properties: (i) it readily dissolves in water to form highly concentrated solutions of relatively low viscosity, and (ii) it effectively stabilizes oil-in-water emulsions (William and Philipps, 2001). Given its biochemical structure and properties, gum arabic performs a number of important functions. It can serve as an emulsifier, stabilizer, thickener, bulking agent, carrier, glazing agent, antioxidant, humectant and firming agent. Industrial applications derived from these functional classes are described in the next chapter.

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# CHAPTER II

## USES

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Gum arabic has many uses, in both traditional practices and modern industrial applications. A gum's suitability for each use depends largely on product specifications. For certain usages, hard gum obtained from *Acacia senegal* may be more desirable than friable gum from *Acacia seyal*, or vice-versa. In addition, industrial applications may require sophisticated processing capabilities that are usually not available in the regions where crude gum arabic is produced.

### A. TRADITIONAL USES

In the drylands of sub-Saharan Africa, gum arabic is used as food, traditional medicine and a basic item for domestic activities, such as laundering and plastering. It is consumed as a famine food in periods of severe drought and food insecurity (Ruffo et al., 2002; Fratkin et al., 2004) and as a regular foodstuff by herders and gum tappers in remote arid zones (Gachathi and Eriksen, 2011).<sup>8</sup> Given its lack of taste and the stigma associated with its consumption, gum arabic is generally rejected as a food source in normal times.<sup>9</sup>

Gum arabic is also used in traditional medicine and religious rituals in various countries in the African gum belt. The gum is believed to combat sore throats, the common cold, backaches, painful joints, stomach and intestinal disorders, kidney pains, eye diseases and haemorrhages. Moreover, in certain communities, gum arabic is perceived to drive away evil spirits and witches. Based on such customary beliefs, the Government of the Sudan developed a marketing campaign to encourage local gum consumption (Muller and Okoro, 2004).

The degree of utilization of gum arabic varies significantly across regions in Africa, in accordance with traditional knowledge associated with acacia trees. For instance, in the Sudan, where experience in gum arabic production has accumulated throughout generations, the gum is the most widely used part of acacia trees. By contrast, in Uganda, where local knowledge of gum arabic is limited, local populations generally opt for using the trunks and branches of acacia trees for fuelwood, fencing and fodder for

domestic animals (Obua et al., 2006; Egadu et al., 2007).

Eltahir et al. (2013) record 23 local uses of gum arabic among gum tappers, collectors and the general population in rural villages in the State of North Kordofan, in the Sudan. For example, gum powder and runny gum are blended with charcoal to produce an ink preparation widely used in schools. In addition, dusty and impure gums are fermented in animal waste, mud and water to yield a special paint that protects houses from heavy rain. In Cameroon and Nigeria, gum arabic is used in the production and cleaning of traditional head caps (Muller and Okoro, 2004; Njomaha, 2008). In the subregion of Karamoja, in Uganda, peasants use gum arabic for repairing household items, gumming spears, gluing arrows and joining leather (Obua et al., 2006). In the Middle East, gum arabic is used as a depilatory or mixed with fat or grease to anoint the body (Wickens et al., 1995).

Although heaps of gum arabic may be found in local markets in the gum belt of Africa, domestic use and local trade are small in relation to exported volumes. Most gum arabic produced in Africa is shipped to developed and emerging economies, where it is processed and used in modern industrial applications.

### B. INDUSTRIAL USES

Thanks to its properties and multiple functions, gum arabic is used for a variety of purposes across many industries. Its principal industrial applications are in confectionary, where it controls texture and inhibits sugar crystallization, and in beverages, where it functions as an emulsifier and flavour encapsulator. Gum arabic is also used in other sectors of the food industry, such as in dairy products, bakery products, dressings, flavourings and dietary fibres. Moreover, it plays an important role as an emulsifier and stabilizer in the pharmaceutical and cosmetic industries. Additional industrial applications are found in ink, paper, printing, lithography, ceramics, photography and pyrotechnics. Once important, use in textiles, paints and adhesives – including the traditional office glue and postage stamps – has decreased significantly, especially in developed countries (Magid et al., 2014).

The exemption of gum arabic from the broad economic sanctions imposed by the United States against the Sudan seems to highlight the crucial role played by the product in some key industries. Introduced in November 1997, the original sanctions prohibited the importation of any goods or services

<sup>8</sup> Whereas fresh wet gum may be eaten directly, dried gum must be diluted in water.

<sup>9</sup> In a survey of 184 rural households in the Luwero and Nakasongola districts of Uganda, Obua et al. (2006) found that 6.5 per cent of respondents acknowledged consuming gum arabic as food. Gum arabic is also used as an appetite suppressant in Burkina Faso (Shackleton et al., 2011).

of Sudanese origin, other than information or informational materials. However, due to inadequate commercial quantities of high-grade raw gum arabic available from other countries, the Secretary of the Treasury, upon recommendation of the Secretary of State, issued limited licences between 1997 and 2000 to permit United States processors to import gum arabic in raw form from the Sudan. Finally, in November 2000, following pressure from domestic manufacturers,<sup>10</sup> the United States Congress adopted legislation that required prompt consideration of any license application for the import of gum arabic from the Sudan, making the dried acacia exudate the sole product to be effectively exempted from the comprehensive trade restrictions for almost 17 years.<sup>11</sup>

The gum arabic market can be best understood as the sum of separate market segments. In each segment, the special properties of the gum allow it to perform important functions in product formulations. The main market segments for gum arabic are examined below.

### Confectionery

An important reason for the prominent role of the confectionary industry among users of gum arabic is that this essential input may be used in high concentrations in some confections. For example, hard candies are prepared using gum arabic at concentrations between 40 per cent and 55 per cent of total solids. Soft candies, including candy bars, chocolates and nougat, are generally 30 to 35 per cent gum arabic. In the United States, food safety regulations allow soft candies to be up to 85 per cent by weight gum arabic.

The first key function played by gum arabic in most confectionary products is the prevention of sugar crystallization. Therefore, it finds substantial application in confections with a high sugar content and low moisture content, such as jujubes and pastilles. The second main function played by gum arabic is to act as an emulsifier, maintaining a uniform distribution of fat across products and preventing the formation of greasy and oxidisable films at the surface.

<sup>10</sup> United States manufacturers argued that unilateral sanctions lessened the quality of their products, reduced their sales domestically and abroad, and provided a qualitative advantage to foreign competitors. The inability to import high quality Sudanese gum arabic negatively impacted not only domestic gum arabic processors, but also numerous domestic manufacturers in the beverage, food, pharmaceutical and other industries.

<sup>11</sup> The United States comprehensive ban on imports from the Sudan was revoked on 12 October 2017.

In addition, gum arabic has other important functions for particular types of confections. For example, it may be used as a whipping agent in aerated confections (such as marshmallows, nougat and meringues), a film former in confectionary coatings (such as chocolates, nuts and dragees), a gelling agent in the preparation of liquorice, or a binding agent in the production of chewing gum. While hard gum is the best type of gum arabic for most applications in the confectionary industry, friable gum is preferred for confectionary coatings.

In low-calorie candies, gum arabic is used to compensate for the loss of texture, mouthfeel and body resulting from the replacement of sugars by artificial sweeteners (Checkuri et al., 1983; Huzinec and Graff, 1987). Moreover, the caloric content of a confection may be decreased by increasing the percentage by weight of gum arabic in the product formulation (Flowerman, 1985).

The global gum arabic shortages in 1973–1974 and 1984–1985 led many companies to develop alternative formulations involving other hydrocolloids, such as starches or pectins, for partial or total replacement of the unavailable gum. In the United States, non-dietetic hard and gummy candy makers nearly completely eliminated the use of gum arabic in the second half the 1980s, in favour of readily available, less costly and only slightly underperforming starches. In confectionary coatings, the switch was only temporary, as manufacturers readopted gum arabic after starch reformulations proved inferior in quality (Flowerman, 1985). In the wine gum industry of the United Kingdom of Great Britain and Northern Ireland, gum arabic was found to produce a clarity that could not be matched by other hydrocolloids, in addition to providing a controlled flavour release (Williams and Phillips, 2001).

### Beverages

Gum arabic is widely used in the preparation of concentrated flavour oil emulsions for use in cola and citrus-based soft drinks. It inhibits droplet flocculation and coalescence in concentrated emulsions and solutions with sugar-containing carbonated water. A typical beverage emulsion contains 5–20 per cent gum arabic, 4–8 per cent flavour oil, and 4–8 per cent weighting agent. Gum concentration in the finished product is lower than during the manufacturing process (usually under 1 per cent). In the United States, gum arabic may not exceed 2 per cent by

weight of beverages and beverage bases. This contrasts sharply with the high permitted usage levels in soft candies.

Gum arabic is an effective foam stabilizer for beverages and is largely responsible for the lace curtain effect on the sides of beer glasses. It also functions as a clouding agent, giving an eye-appealing opacity to beverages, which imitates the effect of added fruit pulps and juices. In winemaking, the major application of gum arabic is to stabilize young red wines against colour pigment precipitation and copper, iron and protein hazes. In addition, it reinforces organoleptic characteristics in both white and red wines, imparting softness and roundness, diminishing bitterness and astringency, and leading to a better taste and mouthfeel perception (Iniesta Ortiz and Ramírez Carrera, 2005; Teissedre, 2012). In beverage dry mixes, gum arabic produces opacity, appearance, mouthfeel and palatability similar to natural fruit juices. Gum arabic is also a source of soluble fibre in low-calorie and dietetic beverages (Phillips, 1998).

Hard gum is the preferred type of gum arabic in the beverage market segment, as it is best at stabilizing beverages with various ingredients. However, both hard gums and friable gums are used in winemaking: the former for their stabilizing power; the latter for imparting roundness and improving mouthfeel. Beverages are the main application of gum arabic in Europe, due to its wide utilization in wine, beer, whisky and other beverages. The beverage segment is also important in certain non-European countries with significant wine production, such as Argentina, Chile, South Africa and Uruguay.

### Other food industries

Gum arabic finds extensive use as an encapsulating agent for flavours that are incorporated into dry foods, such as soups and dessert mixes. The gum forms a coating around the flavour particles and inhibits oxidation and evaporation of volatile material. Generally, dry food mixes are 7 per cent flavour and 28 per cent gum arabic. However, in order to reduce costs, gum arabic may be used in conjunction with maltodextrin, in a proportion of 10 per cent flavour, 15 per cent gum arabic and 25 per cent maltodextrin.

In the dairy industry, gum arabic is used as a stabilizer in frozen products due to its water absorbing properties. Its addition produces a finer texture in ice cream, prevents the formation of ice crystals and retards melting. Gum arabic provides sealing and glossy

coating in cereals and baked goods, and a fibrous, fruit-like texture in jelly products. It also functions as an emulsifier in chips, pretzels and dressings; as a stabilizer and thickener in non-dairy milk, creamers, coffee and toppings; and as an emulsifier, stabilizer and thickener in gelatines, puddings and fillings.

Hard gum, which is 85 per cent soluble dietary fibre, is used in foods bearing fibre-related nutritional claims. However, as gum concentrations in such applications are high, some manufacturers prefer to use cheaper friable gum. Functional foods are a new and growing segment, the development of which is closely linked to regulatory approvals of health claims by competent authorities. For example, previously accepted only as a food additive, gum arabic is now accepted as a food, food ingredient and dietary fibre of low calorific value. The newly acquired status should facilitate the approval of other claims in the future.

### Pharmaceuticals

In the pharmaceutical industry, gum arabic is employed to control viscosity, improve density, suspend insoluble drugs and prevent the precipitation of heavy metals from solutions. It is also used as an emulsifying agent, an adhesive or binder for pharmaceutical tablets, a masking agent for acrid tasting substances, and a demulcent in cough syrups. Gum arabic may be used in the preparation of calamine, kaolin, cod liver oil emulsions, antiseptic preparations, vitamin premixes and food supplements. In some countries, gum arabic may be found in capsule form at pharmacies and health food stores. Although it may help control obesity or aid weight loss, scientific evidence is inconclusive in this respect.

### Cosmetics

Gum arabic is used in a variety of cosmetics, particularly in liquid makeup products. It functions as an emulsifying and stabilizing agent in lotions and creams, as a protective agent in hair care products, as a foam stabilizer in liquid soaps, as a thickener in lipsticks and mascara, as a binding agent in face powder cakes, as a film-forming agent in peel-off masks and as an adhesive in blusher and dental adhesives.

### Printing

In the printing industry, gum arabic is used as a base for photosensitive chemicals, as a component of solutions used to increase hydrophilicity and impart

ink-repellency to metal plates, and as a protective coating to prevent plate oxidation.

### Other industries

Although gum arabic is used in a multitude of other sectors, they account for a small share of total demand, especially when compared with the food and beverages sector. For example, gum arabic is used as a protective colloid and suspending agent in the production of inks, pigments and dyes (for which friable gum is preferred due to its lower cost). Gum arabic is also used as a plasticizer in concrete, a suspending agent in insecticides and pesticides, and a binder and adhesive in fireworks, explosives and cartridge powder.

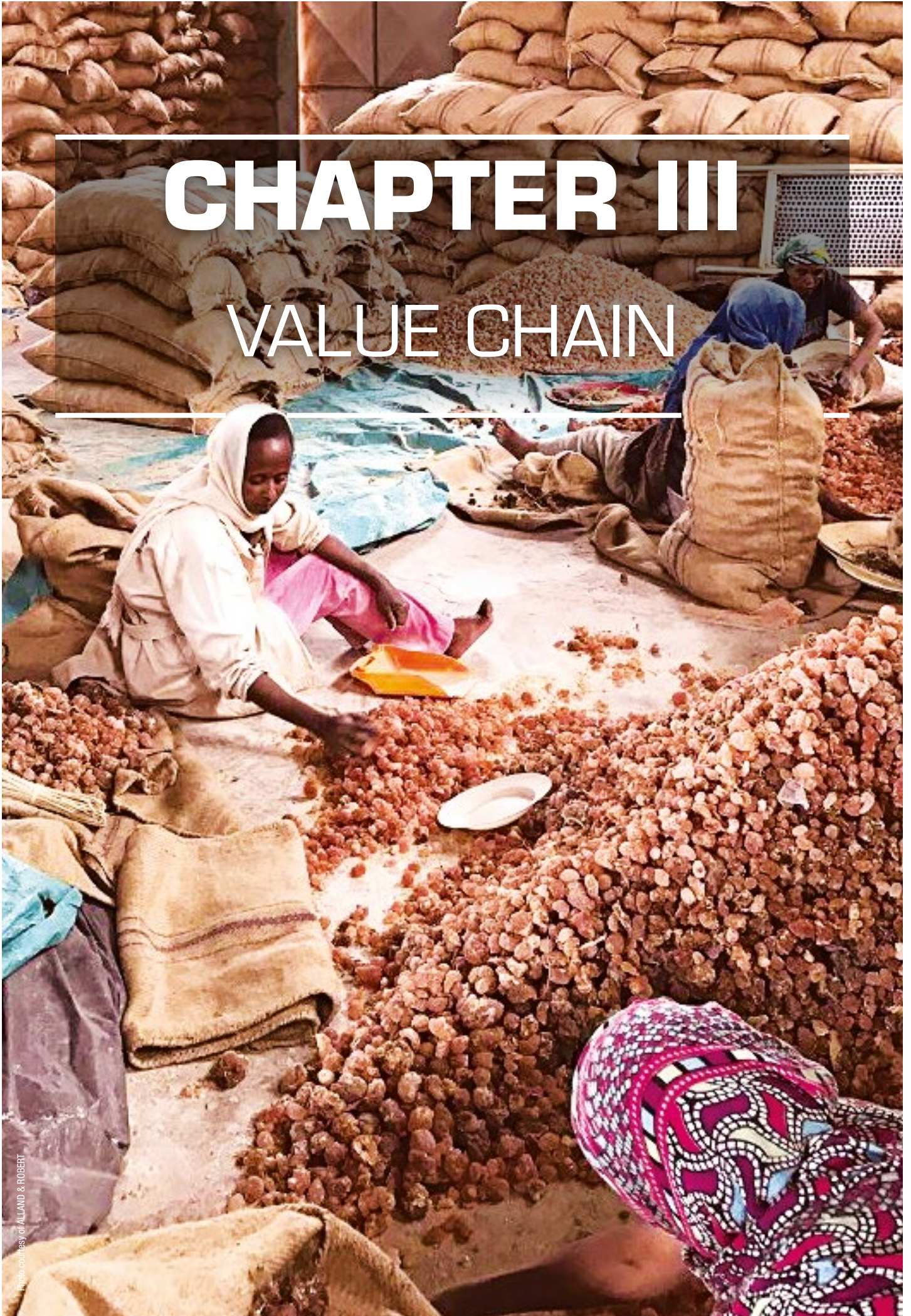
In addition, gum arabic is used to size paper, strengthen clay in ceramics and control scent diffusion in incense cones and oil candles. It may also be found in shoe polish, pet foods, photograph developing solutions, carbonless copying papers and technical ceramic materials used in the electronics industry.

Gum arabic was once widely used as a sizing and finishing agent in textiles, but the cost is now prohibitively high compared with modern substitutes. Nonetheless, limited use is still found in finishing silk and rayon. Whereas gum arabic was formerly employed in the preparation of paints, adhesives and glues, application in these industries has been mostly supplanted by synthetics.



# CHAPTER III

## VALUE CHAIN





Value chains describe the range of activities required to bring a commodity from the producer to the consumer, emphasizing the value added at each successive stage. In the case of gum arabic, it may include tree cultivation, harvesting, drying, cleaning, sorting, grading, transportation, storage, processing, marketing and industrial application. Some activities, such as sorting, transportation and processing, may occur several times, at different stages and locations, before the gum reaches the end consumer. Millions of stakeholders participate in the gum arabic value chain on a global scale. The majority are producers in developing countries, who may be collectors, tappers or harvesters. Other agents involved in the value chain include input providers, local merchants, traders, cleaners, sorters, graders, storage and transportation professionals, exporters, importers, processors, users in various industries and the Government.

Gum arabic may be sold through different channels. For example, while some producers may sell their output directly to local retailers or processors, most depend on intermediary agents, who clean, sort, grade, store, transport and export the gum for processing and use abroad. The distribution of returns among agents varies significantly across channels: the greater the number of intermediaries, the lower the return to producers. Gum arabic value chains may vary significantly across and within national boundaries in sub-Saharan Africa. Nonetheless, a number of common patterns are observed in all gum producing countries in the region, including the inequitable sharing of benefits among value chain participants, low value addition, export orientation, and gender segmentation. This chapter analyses the organization of the gum arabic sector,

with a focus on its main agents and the distribution of market returns along the value chain. It examines both the commonalities and idiosyncrasies across countries. A simplified schematic overview of the gum arabic global value chain is depicted in figure 1.

As gum arabic advances through successive stages in the value chain, it may undergo a number of transformations. Table 1 lists types and grades of gum arabic by ascending level of product sophistication. The gum collected by producers needs to be dried for at least three weeks before it can be packed and sold to merchants. It must also be cleaned, sorted and graded based on botanical origin and physical characteristics, such as nodule size and colour, before it is sold to processors or exporters. In the Sudan, *Cleaned* is the standard grade of hard gum. It is composed of whole and broken nodules with a diameter between 10 mm and 20 mm. Although free of dust, it contains siftings.<sup>12</sup> *Cleaned amber and sifted (CAS)* is a step above *Cleaned*. It is composed of whole and broken nodules with a diameter above 20 mm, pale to dark amber in colour. It does not contain dust or siftings. The highest grade of hard gum is *Handpicked select (HPS)*, which is composed of whole nodules with a diameter above 30 mm and light in colour. HPS is manually cleaned and does not contain fragments, siftings or dust. The siftings collected during the cleaning and sorting process are sold as a by-product. For friable gum, the common grades in the Sudan are *Talha cleaned* (diameter above 4 mm), *Talha sifting* (0.5–4 mm in diameter) and *Talha dust* (diameter below 0.5 mm).

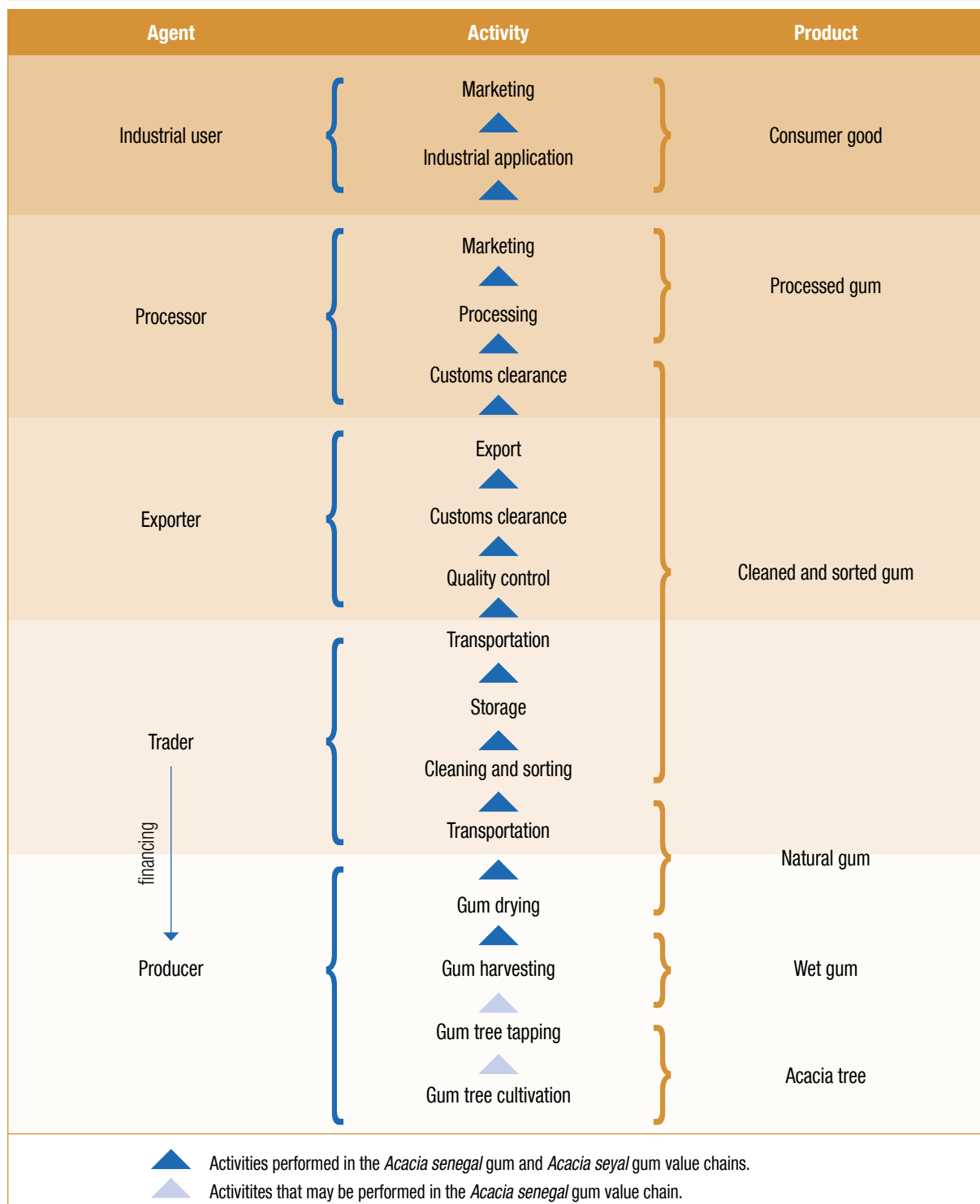
<sup>12</sup> Siftings are a mixture of small particles of gum arabic (diameter between 2.5 mm and 10 mm), sand, bark and other impurities.

**Table 1 Gum arabic products by ascending level of sophistication**

Type or grade	Description
Wet gum	Freshly collected gum
Natural gum	Semi-dried gum (about three weeks after collection)
Cleaned	Whole or broken nodules (diameter: 10–20 mm)
Cleaned amber and sifted (CAS)	Whole or broken nodules (diameter above 20 mm), pale to dark amber colour, dust and siftings removed
Handpicked selected (HPS)	Whole nodules (diameter above 30 mm), lightest colour, dust and siftings removed by hand
Kibbled gum	Mechanically broken and sieved CAS or HPS
Mechanical powder	Mechanically powdered HPS or CAS
Spray-dried powder	Spray-dry powdered HPS, CAS or kibbled gum
Instant soluble gum	Granulated gum with improved solubility
Specialty gum	Proprietary, customized gum

Source: UNCTAD secretariat.

**Figure 1 Gum arabic global value chain: Simplified scheme**



Source: UNCTAD secretariat.

Note: This diagram provides a simplified graphical representation of the agents, activities and products involved in the gum arabic value chain. Actual flows may vary significantly across countries and over time. For example, some producers may sell natural gum directly to local consumers; some traders may resell natural gum in the informal market; some local processors may process the cleaned gum into kibbled or powdered gum prior to export; or some foreign processors may export specialty gums to industrial users in a third country.

In Nigeria, gums are graded into *Grade 1* (hard gum, comparable to the *Cleaned* grade of the Sudan), *Grade 2* (friable gum and gums from other *Acacia* species) and *Grade 3* (mixes that may contain gums from *Acacia*, *Combretum*, *Albizia* and other genera, as well as siftings). In Chad, gums are also categorized into grades according to botanical source: *Kitir* (hard gum) and *Talha* (friable gum). However, in many other countries, the inexistence of grading systems implies that producers and traders fail to capture value from quality differentiation. As a result, high- and low-quality gums are sold in mixed batches at low unit values.

In order to achieve greater efficiency in industrial applications, crude gum arabic must be refined into more readily soluble forms. The appropriate level of refinement varies according to the desired application. There are two main ways of processing gum arabic: the dry channel, in which successive crushing, sieving, mechanical purification and calibration operations transform crude gum arabic into kibbled gum and powdered gum; and the wet channel, in which crude gum is dissolved in water, centrifuged, filtered and sterilized to obtain spray-dried gum. In addition, some processors produce specialty and customized high-grade gums tailored to specific industries and functionalities. Mechanically powdered gum offers slower solubility (two hours) when compared with spray-dried gum (20–30 minutes) or instant soluble gums (less than 5 minutes). Although there may be significant heterogeneity among processed gums in terms of their per unit value, their chemical composition remains the same. The transformation of crude gum arabic into higher value-added products improves solubility, but does not alter its chemical makeup. The following sections examine the main agents involved in the gum arabic global value chain and the value added in each of its consecutive stages.

## A. PRODUCERS

Producers are the first agents in the gum arabic value chain. Their main functions are to collect, dry, pack and deliver the product to a point of sale. Depending on their skills, as well as on land tenure and the botanical source of the gum, producers may also cultivate gum gardens, tap trees, and clean and sort gum. Although some producers are members of farmer-based organizations that increase their bargaining

power vis-à-vis buyers,<sup>13</sup> most are dispersed and lack access to market information, financing and adequate infrastructure. As a result, producers are poorly integrated into the global gum arabic value chain, accruing a minor share of the total value added.

Gum arabic producers are generally small, resource-poor, low-income subsistence farmers or pastoralists. Many engage in gum arabic production to enhance household income during the off-season of their primary economic activity, when cash flows fall and food insecurity tends to rise. There are also medium-sized and large producers. Families with large areas at their disposal may hire labour, lease land or enter into share-cropping arrangements with collectors.

Gum collection is an important livelihood activity for vulnerable groups, including women, ethnic minorities,<sup>14</sup> seasonal labourers<sup>15</sup> and the very poor. The gender division of labour varies significantly across countries and gum types. In many countries, low returns to labour discourage men and wealthier groups from engaging in gum production. For example, in Kenya, gum collection is dominated by women, as men are involved in pastoralist activities with higher returns to labour (Mujawamariya and Karimov, 2014). In Burkina Faso and the Niger, gum collection is carried out primarily by women and children, as adult men consider it an inferior and marginal activity with low remuneration (Duhem, 2004; Shackleton et al., 2011). In Cameroon, both men and women collect friable gum from forests, though women are the majority. On average, men travel longer distances to collection sites (15–20 kilometres, compared with 8–12 kilometres for women) and collect higher quantities of gum per work day (12.5–15 kilograms, compared with 7.5–10 kilograms for women). Conversely, Cameroonian women do not participate in the production of hard gum, which is harvested in plantations, due to their poor access to

<sup>13</sup> For example, in the Sudan, there are 36 gum arabic producer cooperatives, with 2,338 members, organized under the Gum Arabic Producers Association (GAPA). GAPA administers credit activities (price negotiation, credit delivery and repayment collection), supervises the inputs delivery and distribution systems (including drinking water) and participates in several village school development activities (El Tahir Vishwanath, 2015).

<sup>14</sup> For example, 10 per cent of the surveyed gum collectors in the villages of Boundoré, Kollakoye and Tambond, in the Yagha province of Burkina Faso, belonged to marginalized minority ethnic groups (Shackleton et al., 2011).

<sup>15</sup> Seasonal labourers, largely migrants from the poorest and driest regions of a particular country, face working conditions and pay that are less favourable than those faced by local workers subject to established norms.

land ownership and to cultural norms that reserve this activity for men (Njomaha, 2008). In the Sudan, where *Acacia senegal* is the dominant species, gum arabic production is controlled by males. Since tapping and harvesting commonly take place in remote areas, local communities perceive these activities as unsuitable for women. Paradoxically, historical accounts of gum arabic production reveal that women collected gum in Sudanese forests alongside men and children in the nineteenth century (Pallme, 1844). Between 2009 and 2014, the International Fund for Agricultural Development (IFAD) and the Sudan Multi-Donor Trust Fund extended funding and training to 10 associations entirely comprised of female farmers in five Sudanese localities as a way of reviving the tradition of gum harvesting.

Production skills may vary significantly across and within countries in Africa. For instance, a large skill imbalance exists between the two main gum arabic producing regions of the Sudan: the western sandy soils (regions of Kordofan and Darfur) and the central and eastern clay soils (States of Gedaref, Kassala, Blue Nile and White Nile) (El Tahir and Vishwanath, 2015). Due to limited skills among local communities in Gedaref, gum tapping and harvesting are carried out by highly skilled males from the Kordofan region. Insufficient production and marketing skills are one of the prevalent causes for low productivity and output in a number of gum producing countries, including Burkina Faso, Kenya, the Niger, South Sudan and Uganda.

Due to limited skills among local communities in Gedaref, gum tapping and harvesting are carried out by highly skilled men from the Kordofan region. Insufficient production and marketing skills are one of the prevalent causes for low productivity and output in a number of gum producing countries, including Burkina Faso, Kenya, the Niger, South Sudan and Uganda.

Gum arabic production may vary in two key dimensions: cultivation status and production method. With respect to cultivation status, gum arabic may be produced from either uncultivated forests or cultivated plantations. Regarding production techniques, producers may collect gum that exudes spontaneously from trees (in which case they are known as collectors), or tap trees by means of incisions in their branches and harvest the gum some weeks later (in which case they are known as tappers and harvesters). The two production dimensions are

interconnected in the case of friable gum, as this type of gum arabic is collected from uncultivated *Acacia seyal* forests and without prior tapping. However, hard gum may be obtained from *Acacia senegal* forests or plantations, either with or without tapping.

Tapping followed by harvesting is a dominant production method in Senegal and the Sudan, and is also practiced in Nigeria. However, in many gum belt countries, including Burkina Faso, Kenya, the Niger, Uganda and the United Republic of Tanzania, *Acacia senegal* gum is normally collected without prior tapping. By way of illustration, in the Niger, a survey of 560 gum arabic producers revealed that only 5.1 per cent of them tapped trees prior to harvesting (Elhadji Seybou et al., 2016). In Cameroon, tapping was practiced by between 3 per cent and 18 per cent of producers during the 2006/07 harvest season (Peltier et al., 2010).

Although tapping may double or even triple the gum yield of *Acacia senegal* trees, many producers do not possess the skills and instruments required to perform it in an economically viable and environmentally sustainable manner.<sup>16</sup> The decision to whether or not tap is also linked to land tenure. As gum harvesting occurs at least 14 days after tapping, a producer needs a reasonable degree of assurance that other producers will not harvest gum from the trees that he or she tapped. Thus, in communal or open access lands, producers lack incentives for tree management and tapping. Tapping is more likely to be adopted in jurisdictions with well-defined property rights. However, in many countries, formal and customary rules may diverge regarding the attribution of rights to forestry products.<sup>17</sup> Private production units, generally associated with higher efficiency in terms of quantity and quality, are common in the Sudan and are becoming increasingly so in Senegal. According to Mujawamariya and Burger (2016), the transition from communal to private collection systems, at the village level in Senegal, has tended to occur “where labour for collection is available, competition for the resource is high, forests where gum is collected are located near the village or market prices are high enough to

<sup>16</sup> If done incorrectly, tapping may harm the tree and reduce productivity. For example, non-judicious tapping almost led to the local extinction of acacia trees in Mauritania in the early twentieth century (ITC, 1978).

<sup>17</sup> In general, property rights for land and forest products are formally defined in national forest legislation. However, indigenous acquisitions through lineage and kinship, and tacit appropriations, may also be commonly found (Freudenberger, 1993; Mujawamariya, 2012).

attract occasional collectors who reinforce the effect of competition". Since these conditions are not found in many parts of the African gum belt, communal systems remain widely prevalent.

Transaction costs and the availability of market information are key determinants of where smallholders sell their products (UNCTAD, 2015). For example, in the Sudanese State of Gedaref, small producers are unable to sell at larger and more lucrative markets if their amounts of gum are less than four kantars, or approximately 180 kilograms (El Tahir and Vishwanath, 2015). With small quantities, poor logistical connections and limited access to market information, most gum producers sell to intermediary merchants at the farm gate or village markets, where profitability and growth potential are low. In addition, small producers commonly resort to moneylenders among village merchants, who advance loans on the condition of purchasing the producer's forthcoming harvest at a price below the market rate. The limited exposure to markets among gum arabic producers finds parallels in other commodity sectors in developing countries. For example, Fafchamps and Hill (2005) show that 80 per cent of Ugandan coffee farmers sell their output at the farm gate, commonly to small traders that act as aggregators for either large independent traders or exporters and their agents. As in many gum-arabic-producing regions, producer access to price information is limited to interactions with itinerant traders.

## B. TRADERS

Traders play an important role in linking agricultural producers with markets and creating economies of scale in developing countries (UNCTAD, 2015). Since gum arabic producers in sub-Saharan Africa are generally small and resource-poor, intermediary traders aggregate quantities from individual smallholders and sell in bulk to processors or exporters. They may also add value to the gum, by cleaning, sorting, grading, transporting and storing. Several layers of intermediaries may be found in a given country, including at the primary (local), secondary (regional) and terminal<sup>18</sup> markets. Since all intermediaries must be compensated for their services, producers tend to receive a smaller share of total profits in markets with a higher number of stakeholders.

<sup>18</sup> A terminal market is a central site, often in a metropolitan area near major transportation hubs, that serves as an assembly and trading place for commodities (CRS, 2005).

Local intermediaries, who are generally men, may be landowners, moneylenders, village merchants or experienced itinerant traders. They can work privately or as agents for regional traders and companies, in which case they receive commissions. Given the limited penetration of commercial banks and formal financing in rural areas, these local players with greater access to cash and market information may provide informal financing to small gum producers in exchange for their crops, often on unfavourable terms for the smallholders.

In a study of 422 gum arabic producers in Senegal, Mujawamariya and D'Haese (2012) found that interlocked contracts – a form of contract farming whereby inputs or necessity items are advanced to a producer in exchange of a promise to sell crops to the lender at a fixed price – stimulate producers to collect and market gum.<sup>19</sup> Since gum collection requires almost no inputs in addition to labour and special tools that are used for several periods, interlocking involves mainly the supply of household necessities, such as water and food. Producers with interlocked contracts (45 per cent of the sample) not only collected larger quantities of gum arabic, but also obtained larger economic returns. Although interlocking was conducive to production under the prevailing conditions in Senegal at the time of this particular survey, it may also reduce incentives to production, depending on the implied interest rate on credit or inputs.

Local traders generally sell their products to regional traders, who in turn sell them to processors or exporters. In the Sudan, regional traders may acquire gum in well-structured auction markets, where they incur taxes and levies. Subsequently, they clean, sort, grade, store and transport the gum to terminal markets. While transportation and storage services are provided at various stages of the value chain, cleaning, sorting and grading are usually performed at regional and/or terminal markets. Customarily, regional traders hire women to clean and sort gum arabic. Cleaning involves removing sand, bark, dirt and other foreign materials from the product. It is done manually with the help of a knife. During and after the cleaning, the gum is sorted, based mainly on the size and colour of the granule or tear. In the Sudanese town of Gedaref,

<sup>19</sup> Due to the absence of strong regulatory environments in many developing countries, interlocked contracts are enforced through trust and tend to rely on close personal relationships. In Senegal, the affiliation of gum-producing households to local intermediaries results from traditional collaborations and is based on ethnic affiliations, appreciation for support in difficult times and friendship.

a privately owned company employs about 20 to 30 women cleaners and sorters on a temporary basis. For these women, who are generally poor and young, this is an important income-generating activity. Women are singled out for these activities because they are perceived as diligent, patient and more enduring (El Tahir and Vishwanath, 2015). By contrast, they are generally barred from more lucrative roles within the gum arabic value chain by both their lack of capital and social norms. For example, in Burkina Faso, local customs limit the opportunities available to women, as they are not allowed or encouraged to travel to markets or to negotiate with men (Shackleton et al., 2011).

Informal traders, or smugglers, are present throughout the African gum belt. They usually buy gum directly from producers and resell it across borders, such as in the informal market for Cameroonian friable gum, analysed in chapter III.F. Smuggling is generally attributed to domestic policies that cause local prices to be significantly lower than prices in neighbouring countries. Examples of smuggling-inducing policies include export monopolies, privileged State trading enterprises and high taxes and levies.<sup>20</sup> When domestic prices fall below production costs, smuggling may be the only economically viable alternative to producers.

Because of the limited choice of buyers along the gum arabic value chain, producers may get lower prices for their products due to monopsonistic or oligopsonistic behaviour on the part of traders. Mujawamariya et al. (2012b) investigate market concentration and oligopsonistic tendencies in the gum arabic sector by analysing the determinants of market shares and marketing margins for individual traders in the primary, transport and wholesale markets for gum arabic in Senegal. Since concentration was too low to have any influence on margins, oligopsonistic powers could not be confirmed. As marketing margins were found to depend on costs, risk and uncertainty, the authors concluded that traders were not exploitative. Their power is derived from access to capital and market characteristics.

### C. EXPORTERS

Exporters typically reside in large cities, far from gum arabic forests and plantations, though they may have agents in villages closer to production sites. In the Sudan, exporters are typically based in Port Sudan and Khartoum. In Burkina Faso, Chad and Senegal, they

are based in their respective capital cities. While 136 exporters are found in the Sudan, numbers are more limited in other countries. For example, 10 exporters can be found in Chad, 2 in Senegal, 2 in Burkina Faso and 1 in Cameroon and Mauritania. In Cameroon, the Government has effectively created a private monopoly by providing export permits to a single marketing company, the *Compagnie Commerciale pour l'Exportation des Produits* (CEXPRO). In Mauritania, gum arabic is a monopoly of the State trading enterprise, the *Société Nationale d'Importation et d'Exportation* (SONIMEX). Until 2009, a monopoly also existed in the Sudan, where the Gum Arabic Company (GAC), partly State-owned, was the only entity allowed to export the commodity. In recent years, some exporters – such as Achats Service International (ASI) in the Niger, Asyilia Gum in Senegal and CEXPRO in Cameroon – have integrated vertically by owning and managing their own plantations and cleaning and sorting facilities.

After acquiring gum from traders, exporters must refine the cleaning and grading of the product, to ensure that shipments meet international standards. Like traders, exporters hire women to perform these activities. In Burkina Faso, the two existing exporting companies employ women on a temporary basis. One of the two companies employs 13 women, who are paid a guaranteed minimum salary during the sorting season. Most are married (82 per cent) and have no formal education (91 per cent). Gum cleaning and sorting is their most important source of income. As it was observed among Sudanese traders, Burkinabe exporters prefer to hire women because the task requires both dexterity and patience. The women accept the minimum wage and temporary employment because there are limited alternatives available (Shackleton et al., 2011).

After the final cleaning and grading, the gum is increasingly crushed or atomized (depending on the availability of equipment), bagged and put into containers to be sent through customs (UNCTAD, 2016a). Exporters must ensure that shipments pass the required inspections and that certificates are obtained from the competent government authorities, which may include the ministries of finance, trade, forestry, agriculture and religious affairs (for collection of the *zakat*, or religious tax, in some countries).

Most purchases are negotiated on a free-on-board (FOB) basis, although there are also cases in which transactions are conducted on a cost, insurance-and-freight (CIF) basis, especially when intermediaries

<sup>20</sup> For example, stronger government intervention in the gum arabic sector in Mauritania has been associated with reduced official exports and increased smuggling.

are involved. In landlocked countries, the mode of transport may be aerial or maritime via a neighbouring country. In the case of Chad, gum arabic is exported through the airport of N'Djamena or through the port of Douala, in Cameroon. In addition, until attacks by Boko Haram triggered the closing of the Nigerian border in 2014, Chadian gum was purchased informally by Nigerian merchants, transported to the Nigerian city of Maiduguri and then exported through the port of Lagos. Most of the gum arabic produced in the Niger, and over half of the gum produced in Cameroon, were also estimated to follow the same route.

While most exporters interact directly with foreign buyers, a few commissioned brokers may also operate at this stage. Their charges typically range from 1 to 2 per cent *ad valorem*. However, their importance has generally declined. In the 1980s, several buyers from the United States were known to use agents rather than buying directly from exporters.

Upon arrival in the importing country, the gum must once again undergo inspections and clear customs. Import duties on gum arabic are generally low. For example, 38 developed countries and 42 developing and transition economies offer duty-free and quota-free (DFQF) market access to gum arabic imports on a most-favoured-nation (MFN) basis.<sup>21</sup> In most other developing and transition economies, MFN import duties are at or below 5 per cent *ad valorem*. Notable exceptions are China (15 per cent), Pakistan (16 per cent) and India (30 per cent). Nevertheless, China and India offer DFQF market access on a preferential basis to imports from certain least developed countries (LDCs). For example, as of July 2016, India extended DFQF treatment to imports originating in 10 LDCs in the African gum belt: Burkina Faso, Chad, Eritrea, Ethiopia, Mali, Senegal, Somalia, the Sudan, Uganda and the United Republic of Tanzania.<sup>22</sup> Other developing and

transition economies that offer DFQF market access to gum arabic from LDCs include Chile, Kazakhstan, Morocco, the Republic of Korea, the Russian Federation, Taiwan Province of China and Thailand.

#### D. PROCESSORS

The level of gum arabic processing in most countries in the African gum belt is minimal. The main exception is the Sudan, where the domestic processing sector has become increasingly important. In addition, Nigeria and Senegal also possess one high-grade processing facility each. In most other countries, processing is done only at a very basic (cleaning, sorting and grading) or basic (kibbling) level. The increase in the number of processing facilities in the Sudan has boosted competition for crude gum, which has translated into higher prices paid to local traders and producers. For example, after the Ministry of Investment of the Sudan granted licences to 12 gum processors in 2003, crude gum producers received prices that were four to five times the 1998–2002 average producer price (Couteaudier, 2007).

Despite the recent development of gum arabic processing in a few African countries, most high-grade processing still takes place outside the continent, especially in Western Europe and North America. Over 90 per cent of processed gum arabic exports in 2014–2016 originated in these two regions. At least two types of high-grade gum arabic processors can be identified: processors that produce standardized grades of spray-dried and granulated gums, and processors that formulate customized products according to client specifications.

Nexira, a family-owned and managed company based in Rouen, France, is the world's largest producer of processed gum arabic, with a world market share of nearly 50 per cent in 2011. Founded in 1895, the company was previously known as Iranex and is sometimes identified as Colloïdes Naturels International (CNI), which is the name of its main subsidiary. After building its reputation as a global leader in gum arabic, the company expanded into the manufacturing of a wide range of natural ingredients and botanical extracts for food, nutrition and dietary supplements. In 2012, Nexira invested €7 million to expand the annual capacity of one of its plants from 25,000 tons to 30,000 tons. The company has subsidiaries in Brazil, China, Germany, India, Japan, Mexico, the Russian Federation and the United States, and exports about 90 per cent of its output. In 2015, its turnover was €113 million.

<sup>21</sup> Economies that extend DFQF access to gum arabic imports include the following: Antigua and Barbuda, Armenia, Australia, Botswana, Brunei Darussalam, Burundi, Cabo Verde, Cambodia, Canada, Costa Rica, Ecuador, Egypt, El Salvador, Georgia, Guatemala, Haiti, Honduras, Hong Kong (China), Iceland, Israel, Jamaica, Japan, Jordan, Kenya, Lesotho, Liechtenstein, Macao (China), Malaysia, Mauritius, Montenegro, Namibia, New Zealand, Nicaragua, Norway, Panama, Papua New Guinea, Peru, Rwanda, Saint Lucia, Seychelles, Singapore, South Africa, South Sudan, Sri Lanka, Swaziland, Switzerland, the former Yugoslav Republic of Macedonia, Turkey, Uganda, Ukraine, the United Republic of Tanzania, the United States, Zambia and the 28 member States of the European Union.

<sup>22</sup> Despite being LDCs, Mauritania, the Niger and South Sudan were not included in the list of beneficiary countries because their Governments did not submit letters of intent and other required documentation. Cameroon, Kenya and Nigeria were ineligible to the DFQF scheme of India because they were not LDCs.

Alland & Robert is another important family-owned French manufacturer of processed gum arabic. Founded in 1884, it manufactured more than 13,000 tons of gum arabic in 2015. The company has headquarters in Paris, two factories in Normandy and kibbling and sorting facilities in Chad, Mali and Senegal. For its line of organic gum arabic, Alland & Robert maintains a partnership with Ferlo Gomme, a company from the region of Ferlo, in northeastern Senegal. In 2014, Alland & Robert had a turnover of €32 million, 86 per cent of which were from exports.

Agrigum International is a British processor specialized in spray-dried and agglomerated gum arabic products. It is also involved in the production of other hydrocolloids and associated blends to specific customer requirements. Established in 2007, the company has its headquarters in Buckinghamshire, a partner company in the United States, a Bangkok-based commercial office for the Asian market, a laboratory affiliated with the Moscow State University and partnerships with African companies that handle the purchasing and shipping of crude gum.

Other important processors include AEP Colloids and TIC Gums (United States), Drytech Processes (India), Frutarom (Israel), GAC (Sudan), Kerry Group (Ireland), and Norevo and Willy Benecke Natural Gums (Germany). High-grade gum arabic processors maintain partnerships with a number of companies specialized in the sale, marketing and distribution of food ingredients, including Caldic and IMCD (Netherlands), Farbest (United States) and Hawkins Watts (New Zealand).

Some high-grade processors specialize in niche markets. For example, AGFA Graphics (Belgium) produces gum arabic products specifically designed for the printing industry, and Spindal (Italy) is the world leader in the production of gum arabic for oenological use. Spindal's factory in Gretz-Armainvilliers, France, produces a range of gum arabic products that improve stabilization processes and wine quality. The company sources crude gum through the Société des Produits Tropicaux du Mali, its subsidiary in Bamako. Other gum arabic processors specialized in oenology include Laffort, from France, and Enartis, Enologica Vason and Ever, all three from Italy.

In addition to the high-grade processors described above, a number of other companies perform less sophisticated processes with low value addition. For example, Afritec Ingredients, a joint venture of Nexira and the Yagoub Group based in the

Sudan, produces and exports kibbled gum. In-house quality control laboratories ensure that their pre-processed gum meets the optical rotation, viscosity, colour, moisture, potential of hydrogen and emulsifying properties demanded by gum processors abroad. Another example is the Khartoum Gum Arabic Processing Company, a subsidiary of the Baghla Group from Saudi Arabia based in the Sudan, which produces kibbled and mechanically powdered gum.

## E. USERS

As discussed earlier, gum arabic is consumed in its raw form by local groups in the African gum belt, including gum collectors, cap washers and traditional ink makers. However, the share of crude gum arabic consumption in total gum arabic consumption is believed to be minimal. Industrial users are the main end consumers in the gum arabic value chain (see chapter II.B). Many of these users manufacture consumer goods that are internationally well-known, including Coca-Cola, Colgate and M&M's.

Industrial use of gum arabic is distributed across the globe. In 2014–2016, 47 per cent of all processed gum was imported by European countries, 35 per cent by emerging and developing countries and 15 per cent by the United States (see chapter IV.D). However, some industrial users may also purchase unprocessed or semi-processed gum arabic. This is often the case among larger manufacturers, who have the grinding, filtration and spray drying equipment necessary to do their own processing.

Since gum arabic is a minor component in the formulation of a large number of consumer products, it usually does not have a significant impact on their prices.<sup>23</sup> Furthermore, the natural status, multifunctionality and superior performance of gum arabic relative to competing products make it difficult to find perfect substitutes. As a result, price is not the most important factor for most industrial consumers. Quality consistency and supply stability are the main concerns of most manufacturers that use gum arabic in their formulations. These concerns are heightened by the fact that raw material supplies are historically volatile and concentrated in a small number of countries, many of which are characterized by political, economic

<sup>23</sup> Notable exceptions are found in the hard and soft candy segments, where gum arabic is used in large concentration, as described in chapter II.B.



and environmental vulnerabilities. The confluence of these factors helps explain the relative price inelasticity of demand for gum arabic.

## F. VALUE ADDITION

Value addition in the gum arabic sector may vary significantly across producing regions, between botanical sources, and depending on whether transactions occur in the formal or informal market. The value chains for friable gum from the Nord region of Cameroon and hard gum from the State of Gedaref, in the Sudan, examined below, illustrate the diversity of potential scenarios.

### Cameroonian friable gum value chain

Cameroonian producers of *Acacia seyal* gum generally sell their output to local merchants, who in turn have two potential outlets for the purchased product: the formal market, which involves reselling the gum to CEXPRO, the country's only authorized exporter; or the informal market, which entails smuggling the gum to Nigeria. Njomaha (2008) provides a detailed account of value addition in both markets.

Prices, costs and margins in the formal market for friable gum are summarized in table 2. In 2006, producers in northern Cameroon sold unsorted friable gum to local merchants for between CFAF 100 and CFAF 150 per

kilogram (mean price of CFAF 125 per kilogram). Since producers spent between CFAF 22 and CFAF 44 per kilogram on inputs (such as equipment, food and water) and health care, their typical margin was between CFAF 81 and CFAF 103 per kilogram.

Merchants resold friable gum to CEXPRO for a cost ranging between CFAF 175 and CFAF 200 per kilogram (mean price of CFAF 187.50 per kilogram). On average, traders spent CFAF 28 per kilogram on transportation, cleaning, sorting, handling, materials and local taxes. Moreover, the weight loss derived from cleaning out refuse was estimated at 10 per cent, which corresponded to an additional cost of between CFAF 17.50 and CFAF 20 per kilogram. As a result, the typical margin for merchants in the formal market was between CFAF 14.50 and CFAF 17 per kilogram.

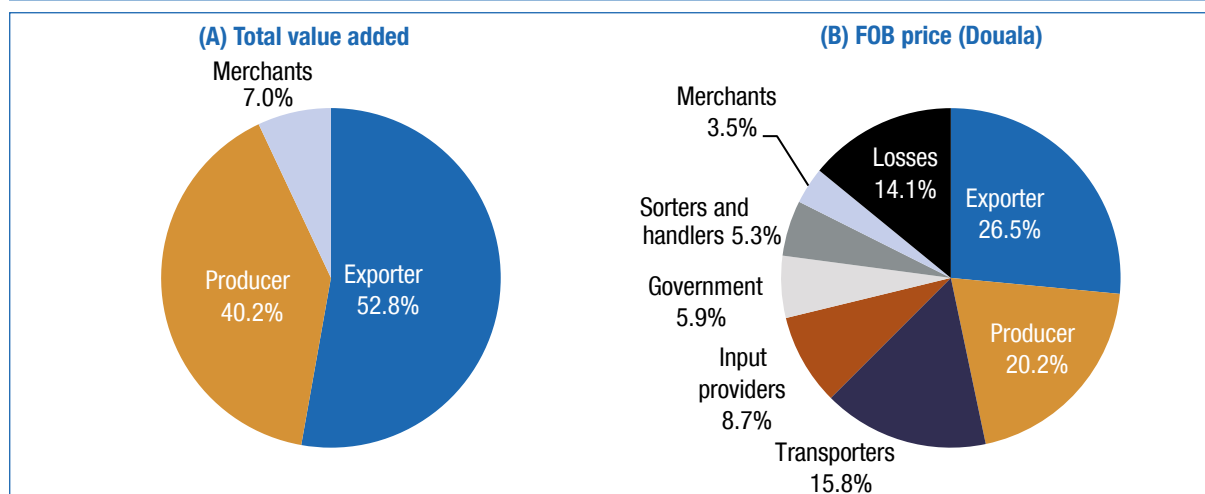
After performing further cleaning and sorting, packaging, transporting and clearing customs, CEXPRO exported the final product from Douala at an average FOB price of CFAF 455 per kilogram. The company spent on average CFAF 101.50 per kilogram on cleaning, sorting, packaging, handling, transportation, materials and customs and other taxes. Assuming an additional weight loss of 10 per cent (CFAF 45.50 per kilogram), the typical margin for the exporter was between CFAF 108 and CFAF 133 per kilogram.

**Table 2 Value addition in the formal market for friable gum, Cameroon, 2006 (CFA francs per kilogram)**

Agents	Purchase price	Selling price	Price difference	Expenses	Value added
Producers	-	100–150	125	Inputs	10–20
				Health care	12–24
				Subtotal	22–44
Merchants	100–150	175–200	62.50	Transportation	21.90
				Materials	2.70
				Handling	1.70
				Local tax	1.70
				10% weight loss	17.50–20
				Subtotal	45.50–48
				Exporters (Douala FOB)	175–200
				Packaging	4
				Transport	50
				Customs and taxes	25
				Handling and storage	10
				10% weight loss	45.50
				Subtotal	147
				<i>Total value added</i>	<i>203.50–253</i>

Source: UNCTAD secretariat calculations, adapted from Njomaha (2008).

Note: For the producer and the merchant, the price difference corresponds to the difference between the mean selling price and the mean purchase price.

**Figure 2** Shares of total value added and FOB price, formal market for friable gum, Cameroon, 2006

Source: UNCTAD secretariat, based on Njomaha (2008).

In 2006, total value added in the formal market was CFAF 203.50 to CFAF 253 per kilogram. Exporters accounted for the highest share of value added (52.8 per cent), followed by producers (40.2 per cent) and merchants (7 per cent) (figure 2A). In terms of shares of the Douala FOB price, exporters accounted for 26.5 per cent, producers for 20.2 per cent and merchants for 3.5 per cent (figure 2B). Losses resulting from cleaning and sorting are significant, at 14.1 per cent. Although producers could increase their remuneration by cleaning and sorting the gum, most lack the skills and resources required to undertake these tasks.

In the informal market (see table 3), the price Cameroonian merchants receive from Nigerian traders is higher than the price paid by CEXPRO (CFAF 200 to CFAF 250 per kilogram vs. CFAF 175 to CFAF 200 per kilogram). While expenses related to cleaning, sorting, handling, materials and local taxes are identical in the two markets (CFAF 6.10 per kilogram), transportation

costs are lower in the informal market, as the distance to the Nigerian border is shorter than the distance to the CEXPRO sorting facility in Maroua (CFAF 16.40 per kilogram vs. CFAF 21.90 per kilogram). Lower transportation costs are mostly counterbalanced by the higher implicit cost associated with the 10 per cent weight loss (CFAF 20 to CFAF 25 per kilogram vs. CFAF 17.50 to CFAF 20 per kilogram). In addition, merchants must pay an illegal commission to complicit customs agents (CFAF 1.60 per kilogram). Since merchants incur total expenses of CFAF 44.10 to CFAF 49.10 per kilogram, their margin in the informal market ranges between CFAF 50.90 and CFAF 55.90 per kilogram, which is at least three times higher than the corresponding margin in the formal market.<sup>24</sup>

<sup>24</sup> By contrast, the producer margin remains unchanged, as producer prices and costs are not affected by the merchant's posterior choice of whom to resell the gum. In the scenario described by Njomaha (2008), it is the local merchant who engages in the illegal transaction, not the producer.

**Table 3** Value addition in the informal market for friable gum, Cameroon, 2006 (CFA francs per kilogram)

Agents	Purchase price	Selling price	Price difference	Expenses	Value added
Producers	-	100–150	125	Inputs	10–20
				Health care	12–24
				Subtotal	22–44
Merchants (Nigerian border)	100–150	200–250	100	Transportation	16.40
				Materials	2.70
				Handling	1.70
				Local tax	1.70
				10% weight loss	20–25
				Customs bribe	1.60
				Subtotal	44.10–49.10
<b>Total value added</b>					<b>131.90–158.90</b>

Source: UNCTAD secretariat calculations, adapted from Njomaha (2008).

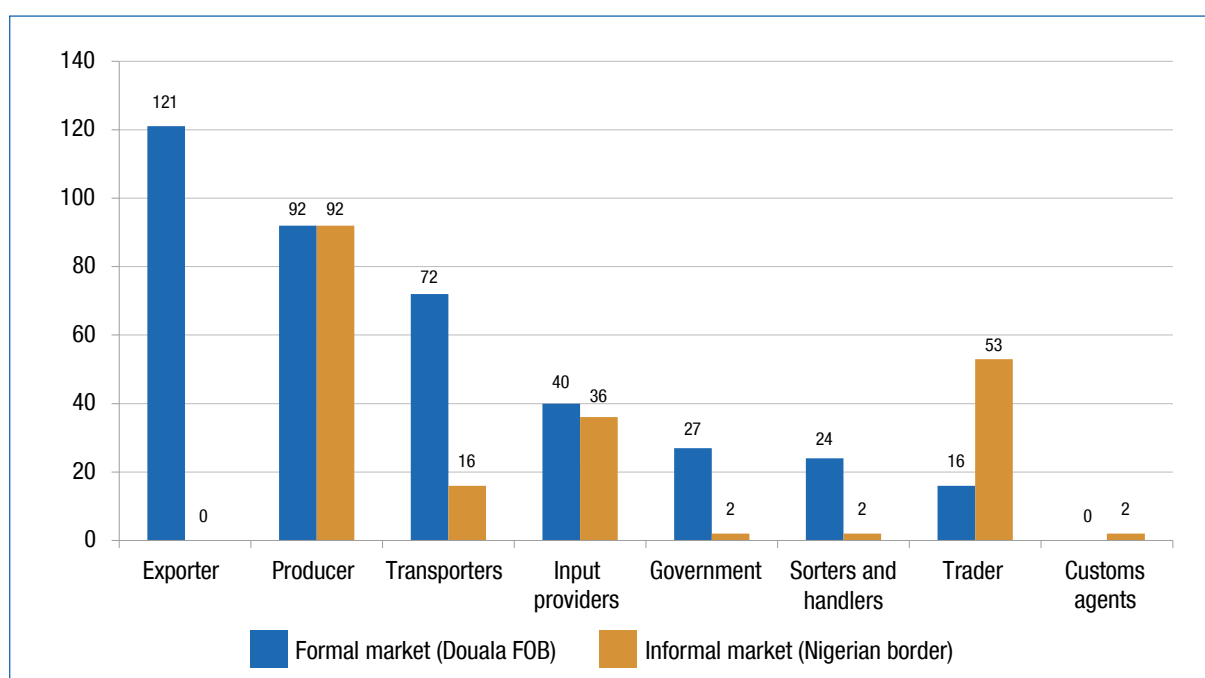
Note: See note in table 2.

Total value added per kilogram within Cameroon in the informal market (CFAF 131.90 to CFAF 158.90) is 36 per cent lower than in the formal market. While the trader is better off in the informal market, the Cameroonian economy as a whole is worse off due to lower domestic value added, employment and Government revenue. In addition to the merchant, the only stakeholder to derive financial gains from the informal market is the customs agent (see

figure 3). While returns to producers in the informal are the same as in the formal market, returns to input providers are 10 per cent lower, returns to transporters, the Government, sorters and handlers are drastically lower, and returns to CEXPRO are nil.

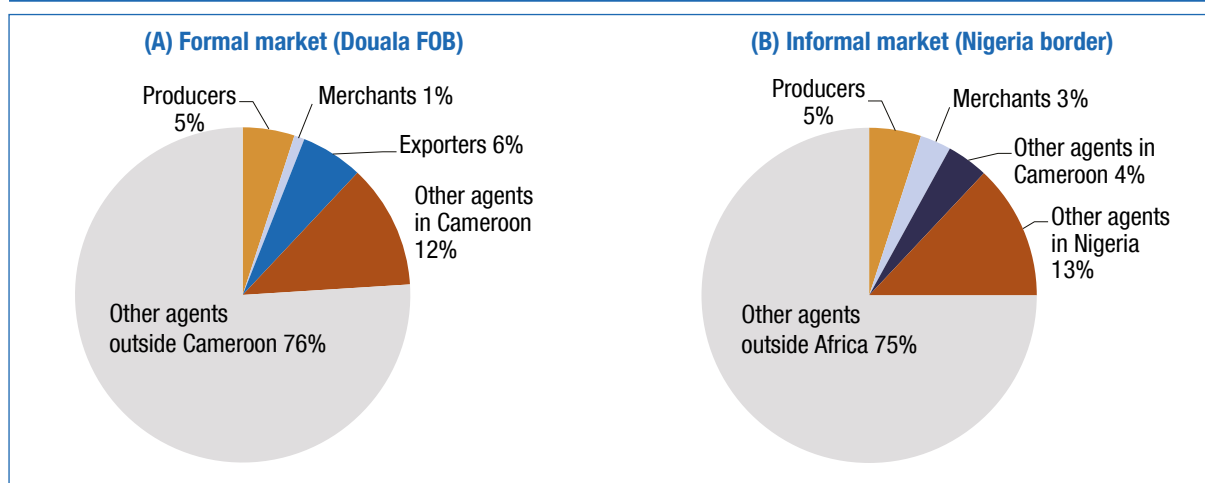
Given the attractiveness of the informal market to merchants, it is estimated that between 40 and 60 per cent of all Cameroonian friable gum was smuggled

**Figure 3 Margins in the formal and informal markets for friable gum, Cameroon, 2006 (CFA francs per kilogram)**



Source: UNCTAD secretariat, based on Njomaha (2008).

**Figure 4 Distribution of FOB export price by market type, Indian processed friable gum, 2006**



Source: UNCTAD secretariat calculations, based on Njomaha (2008).

to Nigeria in 2006. From the Nigerian border towns of Banki, Dogoma and Jilbe, the smuggled gum was first transported to the city of Maiduguri, where it was further cleaned and sorted, and then sent to Lagos, from where it was exported as a Nigerian product. The sealing of the borders of Nigeria with Cameroon, Chad and the Niger in 2014, due to attacks by Boko Haram, put a stop to the informal market. Coincidentally, formal exports of Cameroon through Douala soared in 2014–2016.

Since the costs incurred within Nigeria are not discussed in Njomaha (2008), value addition may not be calculated beyond the Cameroonian border. However, assuming that exported Indian gum arabic is a good proxy for processed friable gum,<sup>25</sup> it is possible to contrast Cameroonian, Nigerian and non-African shares in the FOB export price of the final processed product (figure 4). Average export unit values for Nigerian unprocessed gum (CFAF 485 per kilogram) and Indian processed gum (CFAF 1,928 per kilogram) are obtained from the United Nations International Trade Statistics Database (UN Comtrade).

In the formal market, Cameroonian agents accrued a combined share of 24 per cent of the FOB export price of Indian processed gum in 2006. By contrast, the corresponding share in the informal market was only 12 per cent, as Nigerian agents captured the remainder of the value that was added to the crude gum prior to export. In either scenario, three fourths of the FOB export price of Indian processed gum accrued to agents outside of Africa.

<sup>25</sup> Among the main importers of crude gum arabic, India is the only one that imports mostly friable gum.

Alternative informal marketing channels for crude friable gum in Cameroon, which are not examined in detail in Njomaha (2008), involve direct transactions between Cameroonian producers and Nigerian traders. The latter are known to both finance the production of some Cameroonian producers through informal interlocked contracts and to purchase gum for cash from Cameroonian producers at Nigerian border towns. Depending on the remuneration offered by Nigerian traders and potential cost changes, producer margins could also be higher than in the formal market.

### Sudanese hard gum value chain

El Tahir and Vishwanath (2015) provide a detailed account of the gum arabic value chain in the Hawata region of Gedaref State in 2013. Table 4 summarizes purchase and sale prices, expenses and margins incurred by the agents involved in the chain up to the terminal market in Gedaref city.

Gum arabic producers that participated in the Khalifa and Hai el-Hijra village markets, in the Hawata region of Gedaref State, in February of 2013, sold gum arabic to village merchants for SDG 300 per kantar, after incurring an average production cost of SDG 250 per kantar. As a result, they made a margin of SDG 50 per kantar. Since gum tapping skills are limited in the local communities, producers are skilled male tappers from the Kordofan States, who normally either rent gum gardens from the Forests National Corporation (FNC) and local landowners or are employed by the former. In addition, producers may also enter into sharecropping arrangements with landowners.

**Table 4 Value addition in the market for hard gum in Hawata, Gedaref State, Sudan, 2013 (Sudanese pounds per kantar)**

Agents	Purchase price	Selling price	Price difference	Expenses	Value added	
Producers	-	300	300	Production cost	250	50
Village merchants	300	380	80	Transportation cost	2	78
City merchants	380	550	170	FNC levy	5	120.50
				Market fees	2.50	
				GAU levy	1	
				Zakat	40	
				Other costs	1	
				Total cost	49.50	
				<i>Total value added</i>		<i>248.50</i>

Source: UNCTAD secretariat calculations, adapted from El Tahir and Vishwanath (2015).

Note: Zakat is a religious tax.

Acronyms: FNC, Forests National Corporation; GAU, Gum Arabic Union.

Village merchants transport the gum to the secondary market at Hawata, at a cost of SDG 2 per kantar, where they resell it to city merchants for SDG 380 per kantar, making a margin of SDG 78 per kantar. In turn, city merchants transport the gum to the terminal market in Gedaref city, where they resell the product for SDG 550 per kantar, not before incurring a combined cost of SDG 49.50 per kantar due to fees, levies, the zakat (religious tax), transportation and other expenses. As a result, the city merchant earns a margin SDG 120.50 per kantar.

There are six to eight traders in the Gedaref city market, of which only one is a wholesaler, who buys and sells in large quantities. He purchases gum from producers, village merchants, city merchants and intermediaries. In addition, this same wholesaler regularly purchases all gum traded in the Gedaref auction market. He resells gum arabic either to large local processing companies or to exporters based in other cities in the Sudan, as there are no exporters based in Gedaref.

The value added in the hard gum chain in Gedaref State, from the producer up to the city merchant, is SDG 248 per kantar. There is an upward-skewed benefit distribution among value chain agents, with producers accruing 20.1 per cent of total value added; village merchants, 31.4 per cent; and city merchants, 48.5 per cent. In addition, the commercialization margin is substantially higher than in the Cameroonian examples examined earlier. This is in part because production costs in the *Acacia senegal* plantations of Gedaref are higher than in the open access *Acacia seyal* forests of northern Cameroon. Since Gedaref producers that sell to informal traders (smugglers) obtain a margin that is five times higher than the one

observed in the formal market (SDG 250 vs. SDG 50 per kantar), a significant part of the local output is believed to be smuggled to neighbouring Eritrea and Ethiopia. On average, producer margins in the formal and informal markets in 2013 corresponded to 7.7 per cent and 39 per cent of the Sudanese reference export price, respectively.<sup>26</sup> Increased returns to producers in the formal market could be achieved by organizing producers associations, which increase scale and market power, and by diminishing the number of marketing intermediaries.

In the gum arabic sector, value addition resides mostly at the processing and retail stages, which generally occur outside of Africa. El Tahir and Vishwanath (2015) do not examine the gum arabic value chain beyond Gedaref. The next stage of the value chain would involve local processing or export through Port Sudan. Key marketing costs to the export point consist of transportation, fees and port charges. In addition, insurance, international freight and handling fees bring the crude gum to the import point, after which processing and retail account for significant margins. Differentiating gum arabic into consumable and commercial products is a vital step in value addition. At the final stage of the gum arabic value chain, the margin made by Gedaref producers in the formal market corresponded to 4.5 per cent of the export unit value of British processed gum in 2013. The differentiation of gum arabic into consumable and functional products accounts for the lion's share of value added in the sector.

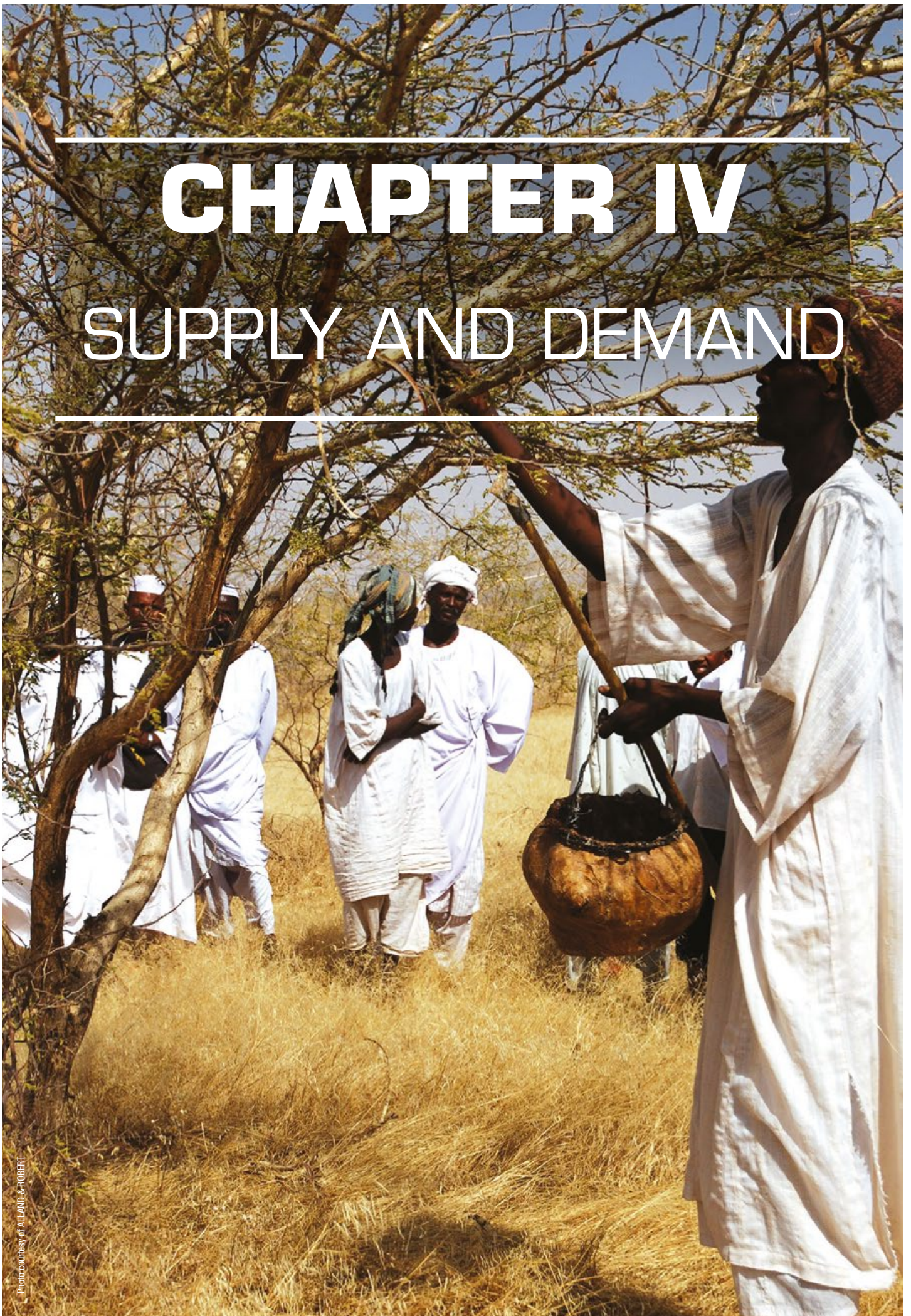
<sup>26</sup> Based on the annual average Kordofan FOB price of \$3,028 per ton in 2013, the official annual average exchange rate of SDG 4.757 per \$1 and a conversion factor of 44.9 kilograms per kantar.

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# CHAPTER IV

## SUPPLY AND DEMAND

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The world market for gum arabic is composed of two main segments: crude gum arabic and processed gum arabic. The crude gum arabic segment includes unprocessed gum and semi-processed gum that undergoes little value addition (such as cleaned or kibbled gum). Virtually all internationally traded crude gum arabic is produced in sub-Saharan Africa. Although crude gum arabic is also produced in parts of South Asia and the Arabian Peninsula, supplies from these regions are outside the scope of the present report due to their small volumes and the fact that they are not traded internationally.<sup>27</sup>

Processed gum arabic includes standard and customized gum powders for industrial applications, many of which are marketed under and protected by proprietary trade names. Processed gum is produced mostly in Europe and North America, either for domestic consumption or export. Paradoxically, African countries that export crude gum arabic at low unit values re-import processed gum at substantially higher unit values to meet local manufacturing demand. Since the 2000s, however, Nigeria, Senegal and the Sudan have produced high-grade gum arabic at local processing facilities.<sup>28</sup>

Analyses of the supply and demand forces shaping the crude and processed segments of the world gum arabic market tend to focus on international trade data, as official production and consumption data are not published by most countries (Muller and Okoro, 2004; ITC, 2008a; ITC, 2008b; ITC, 2009; UNCTAD, 2016a). This approach is also adopted in the current report for the same reasons. Data are obtained from UN Comtrade and from official national and regional sources. Given the strong export-orientation of the gum arabic industry, exports provide an approximate indication of the true levels of production, which may diverge due to domestic consumption, stock changes and smuggling. In importing countries, differences between imports and consumption are due mainly to stock changes and re-exports.

<sup>27</sup> Estimates of crude gum arabic output in India vary considerably, from 5 tons to 800 tons per year, which are fully consumed at the local level (Arora and Ramawat, 2014; Prasad et al., 2015; Srivastava and Ray, 2015; Yogi et al., 2017). At any rate, domestic production in India is negligible when compared to the annual average of 36,000 tons the country imported from Africa in 2014–2016. In addition, the role of *Acacia* species in the rural economy of the Arabian Peninsula is difficult to assess because of their relative scarcity over much of the terrain (Wickens et al., 1995).

<sup>28</sup> Although the first gum arabic spray drying facility in Africa was inaugurated in 1999, in Kano, Nigeria, operational difficulties delayed its full commercial utilization until 2003.

In the Harmonized Commodity Description and Coding System (HS), which is used to categorize internationally traded products, gum arabic is classified under the six-digit subheading HS 130120, irrespective of it being in crude or processed form. Although multilateral rules allow countries to categorize products in greater detail at the national level, by splitting a six-digit code into more specific eight-digit codes, only two countries have not done so in the case of gum arabic: Jordan and the Sudan. As a result, official international trade statistics for all but two countries do not distinguish between crude and processed gums. In order to identify the two segments of the gum arabic market, a few assumptions are necessary: first, trade flows originating in countries in the African gum belt are assumed to consist primarily of crude gum arabic; second, trade flows originating elsewhere are considered to consist primarily of processed gum arabic; third, adjustments are made to account for processed gum arabic exports originating in countries in the African gum belt; and fourth, adjustments are made to account for re-exports of crude gum arabic by countries outside the African gum belt.

## A. CRUDE GUM ARABIC EXPORTS

Many gum arabic producing countries do not publish export data on a regular basis. For example, Chad and Somalia have not reported official export statistics to the United Nations Statistics Division in over 30 years. Other producing countries, like Eritrea and Mauritania, reported detailed export data for less than a handful of years between 1992 and 2016. There are also gaps in reported data among larger sub-Saharan African economies: Nigeria and the Sudan, for instance, did not report gum arabic exports for 10 and 8 years, respectively, in the 1992–2016 period. In order to overcome inconsistencies in data availability across countries and over time, exports are estimated from mirror import data reported by trading partners. Therefore, the export quantity from a reference country in a given year is defined to equal the sum of the quantities that trading partners reported to import from this country in the same year.

In addition to filling important data gaps, mirror import statistics may be more accurate than comparable export data for a number of reasons. First, whereas it is possible for compilers of import statistics to trace the country of origin of a shipment, it is sometimes impossible for compilers of export statistics to accurately predict the country of final destination of

a particular shipment at the time it leaves the country of origin.<sup>29</sup> Second, since importing authorities are required to collect import tariffs and validate the origin of products according to systematic rules of origin, they have incentives to classify products and determine their origin more meticulously than authorities in exporting countries. Finally, import statistics may be more accurate than comparable export statistics due to the stringent technical evaluations and sanitary and phytosanitary inspections generally carried out at the ports of disembarkation, especially for products that may be used in foodstuffs, as is the case with gum arabic.

Estimated annual export quantities of crude gum arabic between 1992 and 2016 are summarized in table 5. They represent a significant improvement over reported export data for five main reasons. First, they provide information for all 16 gum-producing countries in Africa, and not only for the subset of countries that publish international trade statistics. Second, they provide information for 25 consecutive years for all countries, and not only for the short and discrepant subsets of years for which individual countries report national data. Third, they enrich the information available in UN Comtrade database by filling data gaps with official data obtained from national and regional

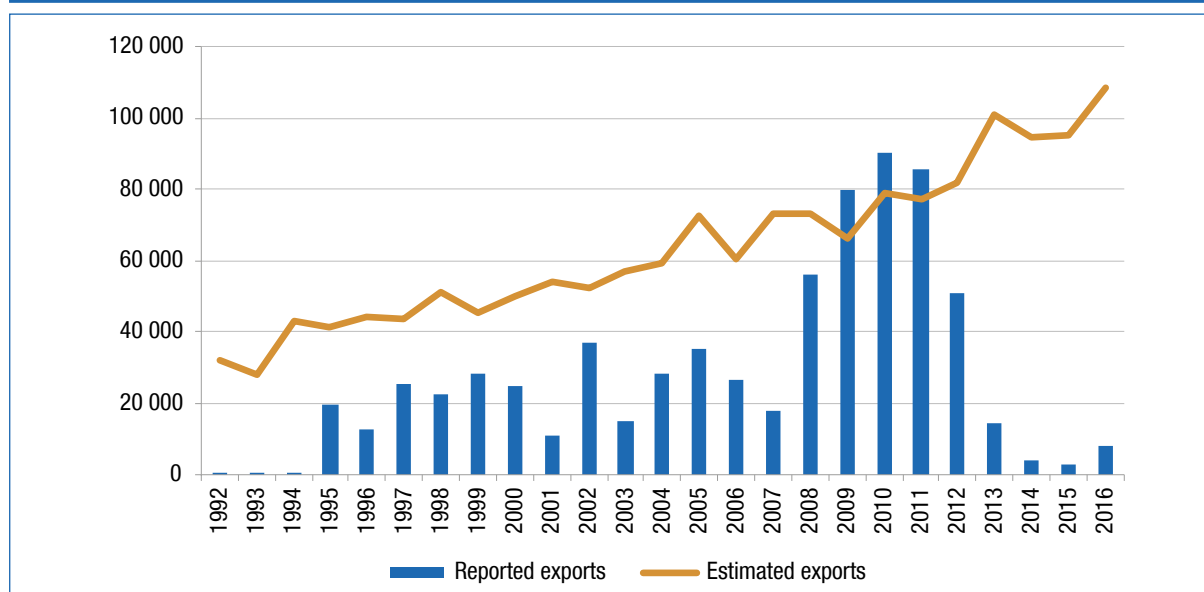
<sup>29</sup> For example, a shipment may be rerouted to a different destination after it leaves the port of consignment. Also, a shipment that is re-exported through a transshipment port will ultimately have a different destination from the one that was originally declared at the port of origin.

sources. Fourth, they include estimates for missing trade quantities when only trade values are reported. Fifth, for countries and years in which data from UN Comtrade are presented on a shipment basis, the present estimates use origin-based trade data from official national and regional sources. Finally, the estimates presented in table 5 reflect adjustments for unambiguously misreported data, such as unfeasibly high values for individual countries in certain years.

Total estimated crude gum arabic exports are consistently higher than comparable reported exports in the 1992–2016 period, except in 2009, 2010 and 2011 (see figure 5). In these three years, reported Nigerian exports are abnormally high (see annex figure A9). Differences between total estimated and reported figures are due in part to the fact that many crude gum-arabic-exporting countries did not report export figures on a regular basis. For example, total reported exports in 2015 correspond to less than 5 per cent of total estimated exports because the three largest exporting countries (the Sudan, Chad and Nigeria) did not submit official export data for this year.

At the national level, differences between estimated and reported figures may reflect the misreporting of a consignment's true country of origin. This generally occurs when a re-exporting country is incorrectly identified as the source of a particular shipment. Differences may also arise from discrepancies in

**Figure 5** Reported and estimated crude gum arabic exports, 1992–2016 (Tons)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Note: Significant country and year gaps are prevalent in reported data.



**Table 5 Estimated crude gum arabic export quantities, by country of origin, 1992–2016 (Tons)**

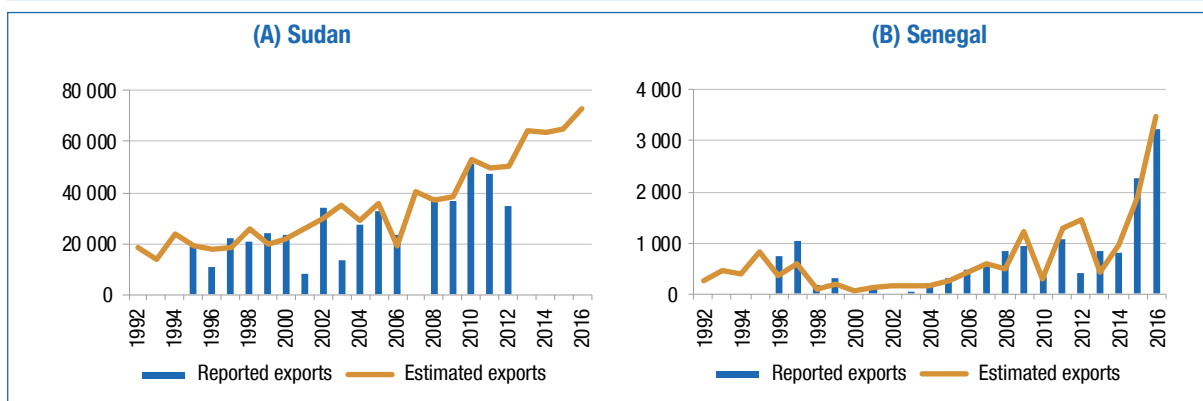
Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sudan	18 491	14 024	23 536	19 375	18 045	18 416	26 043	19 888	21 793	26 050	29 538	34 975	28 798
Chad	2 451	3 695	4 667	6 842	7 397	8 529	12 988	11 124	13 425	12 896	10 961	9 670	12 043
Nigeria	9 014	7 921	11 352	12 160	15 969	12 193	9 909	11 399	10 497	12 299	9 174	9 532	15 282
Cameroon	573	842	1 031	161	650	349	414	927	1 561	757	1 172	783	631
Mali	32	77	249	297	228	502	392	279	136	327	227	285	483
Senegal	261	460	399	833	369	583	96	189	80	121	159	159	176
Ethiopia	60	69	263	129	80	707	65	233	224	215	155	87	202
Eritrea	-	0	0	262	493	712	350	561	780	517	292	305	50
United Republic of Tanzania	917	522	912	709	623	1 398	641	724	933	654	533	995	1 140
Kenya	133	184	284	210	138	19	47	38	142	4	26	13	46
Mauritania	48	55	170	258	256	193	18	2	124	94	0	0	348
Somalia	56	5	171	80	74	44	74	91	35	20	6	3	72
South Sudan	-	-	-	-	-	-	-	-	-	-	-	-	-
Burkina Faso	0	0	0	0	0	1	13	15	0	20	0	31	56
Niger	155	228	241	116	220	172	100	98	80	145	140	65	60
Uganda	0	0	0	0	0	0	0	0	0	0	0	0	0
Producing countries (A)	32 191	28 082	43 275	41 432	44 541	43 817	51 149	45 566	49 808	54 119	52 380	56 904	59 385
African re-exports (B)	99	60	214	247	671	1 011	167	591	290	19	137	10	274
Persian Gulf re-exports (C)	0	0	2	242	3	0	7	49	3	36	43	40	57
Total (D = A + B + C)	32 290	28 142	43 490	41 920	45 215	44 828	51 323	46 207	50 100	54 173	52 560	56 954	59 715

Table 5 (cont.) Estimated crude gum arabic export quantities, by country of origin, 1992–2016 (Tons)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014–2016 average
Sudan	36 046	19 330	40 103	37 230	38 689	53 116	49 481	50 206	63 995	63 809	64 589	72 872	67 090
Chad	14 188	17 810	11 859	16 220	9 416	9 518	10 388	16 067	14 831	10 800	15 793	13 682	13 425
Nigeria	19 075	21 052	17 504	15 447	14 639	13 643	12 947	11 704	16 388	12 222	5 854	7 830	8 635
Cameroon	700	501	310	151	520	510	1 297	618	2 117	4 411	2 625	2 986	3 341
Mali	298	703	437	584	702	297	259	647	402	581	2 364	5 760	2 902
Senegal	266	437	592	480	1 211	293	1 303	1 441	416	961	1 890	3 466	2 106
Ethiopia	131	42	221	873	645	901	469	118	579	560	582	265	469
Eritrea	495	38	688	416	350	51	122	199	208	95	661	639	465
United Republic of Tanzania	602	370	465	542	145	305	409	161	870	347	494	173	338
Kenya	80	50	104	117	70	10	29	124	371	123	176	259	186
Mauritania	146	147	154	242	55	22	174	21	63	132	120	147	133
Somalia	713	69	488	513	50	66	41	255	152	178	107	1	95
South Sudan	-	-	-	-	-	-	0	0	38	62	65	150	92
Burkina Faso	9	38	42	20	21	24	78	140	36	63	18	0	27
Niger	60	117	90	162	27	44	22	36	438	22	20	23	22
Uganda	0	0	0	0	0	0	0	0	0	4	1	2	2
Producing countries (A)	72 807	60 705	73 056	72 997	66 539	78 799	77 017	81 737	100 902	94 368	95 357	108 254	99 326
African re-exports (B)	329	141	0	590	2269	589	2149	786	898	1618	288	2 518	1 475
Persian Gulf re-exports (C)	106	35	11	66	20	205	210	217	377	85	690	2 611	1 128
Total (D = A + B + C)	73 242	60 881	73 068	73 654	68 828	79 593	79 376	82 739	102 177	96 072	96 334	113 382	101 929

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources (mirror data).

Notes: Countries are ranked according to 2014–2016 averages. Dashes indicate years prior to independence. For more information on re-exports, see specific subsection below.

**Figure 6** Reported and estimated crude gum arabic exports, Sudan and Senegal, 1992–2016 (Tons)

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

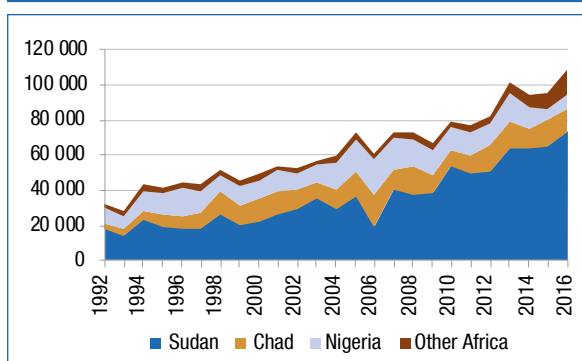
product classifications: while an exporting country may classify a particular shipment as gum arabic, an importing country may classify it as a different product. Finally, time lags between exportation and importation may explain part of the difference between estimated and reported figures. For example, a shipment that leaves an exporting country in December may only arrive at its final destination in the following calendar year.

The fact that estimated exports closely approximate reported exports in countries that publish trade flow data on a more regular basis, such as Senegal and the Sudan, corroborates the advantages and utility of the estimation method for both research and policymaking (figure 6). A comparison of estimated and reported exports for each African crude gum arabic producing country is presented in the annex.

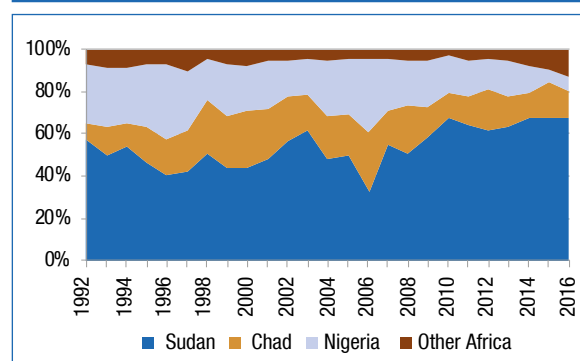
Estimated world crude gum arabic exports surpassed 113,000 tons in 2016, the highest level in recorded history. Between 1992 and 2016, export quantities

expanded at an average annual growth rate (AAGR) of 6.3 per cent. Despite the positive growth trend, recurring shortfalls were caused by severe droughts, insecurity and political turmoil.<sup>30</sup> The crude gum arabic sector was also marked by strong concentration, with three countries – the Sudan, Chad and Nigeria – accounting for over 90 per cent of exports. Figure 7 depicts export quantities in 1992–2016 for the three leading exporting countries, as well as combined exports for the other gum-producing African countries (“other Africa”). Figure 8 illustrates their corresponding market shares in the same period.

<sup>30</sup> Since the 1970s, a significant fall in global crude gum arabic output and exports has been observed at least once every decade, including in 1973–1974, 1985, 1992–1993 and 2006. Prolonged droughts affect gum arabic production in a number of negative ways: first, they harm or wipe out acacia trees; second, they force producers to migrate in search of water and pastures; third, they lead people to cut acacia trees for sale or use as fuelwood; and fourth, potential gum producers may be dissuaded from collecting gum if Governments or aid organizations provide food relief as a result of the harsh climatic conditions.

**Figure 7** Crude gum arabic export quantities, by main exporters, 1992–2016 (Tons)

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 8** Crude gum arabic export quantity market shares, by main exporters, 1992–2016 (Percentage)

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

The Sudan is the world's leading crude gum arabic exporter, despite notable fluctuations in its market share between 1992 and 2016. Once accounting for over 80 per cent of world exports in the 1960s, the country saw its market share decline to 45 per cent in the second half of the 1990s and 50 per cent in the 2000s. Sustained improvement only occurred in the 2010s, when the country recovered the 65 per cent market share it enjoyed in the early 1970s. The export potential of the Sudan remained underexploited until the liberalization of gum arabic trade in 2009, which was followed by a rapid expansion in export quantities. In 2016, Sudanese exports of crude gum arabic reached a record level of nearly 73,000 tons, almost four times as high as the 18,500 tons recorded in the drought year of 1992.

Chad is the second most important exporter of crude gum arabic, having overtaken Nigeria for many years between 1998 and 2016. Despite its large acacia resources, Chad exported gum infrequently prior to 1990, in part due to political instability. Export quantities expanded from 1,000 tons in 1990 to 13,000 tons in 1998, and fluctuated between 10,000 tons and 18,000 tons in 1999–2016. The country's export market share increased from 3 per cent in 1990 to 27 per cent in 2000, the most remarkable expansion for any exporting country in the period. Subsequently, as both the Sudan and smaller exporters picked up their market shares, the participation of Chad receded to 20 per cent in the 2001–2009 and 14 per cent in 2010–2016.

In Nigeria, crude gum arabic exports have been characterized by short spans of remarkable expansion interspersed with longer periods of negative or sluggish growth. The most recent peak occurred in 2006, partly as a response to a drought-related supply shortfall in the Sudan. Subsequently, Nigeria became a less important supplier, both in absolute and relative terms: exports declined from 21,000 tons in 2006 to 8,000 tons in 2016, with a concomitant fall in export market share from 35 per cent to 7 per cent. In 2014–2016, production and exports were disrupted by the high insecurity engendered by Boko Haram. Armed attacks and the perceived threat of violence displaced populations and deterred agricultural labour and the transport of agricultural goods to markets in Borno and Yobe, the two most important gum-arabic-producing States in Nigeria. Van den Hoek (2017) found a strong correlation between the frequency of Boko Haram attacks and the decline in agricultural market activity

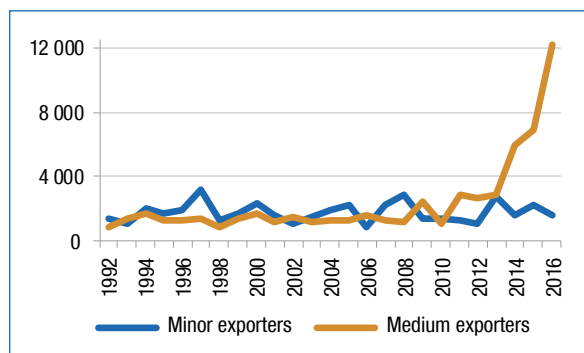
and stability between November 2014 and December 2016. In addition, the sealing of Nigerian borders with Cameroon, Chad and the Niger, in order to better combat Boko Haram, disrupted cross-border trade, including the inflow of foreign gum arabic that used to be re-exported as a Nigerian product.

The other countries of the African gum belt, labelled "other Africa" in figures 7 and 8, have become more important exporters of crude gum arabic, especially since 2013. Combined exports from this group of countries fluctuated between 2,000 tons and 4,000 tons per year in 1992–2012, but expanded rapidly ever since, reaching 14,000 tons in 2016. For the first time in the last 25 years, combined export quantities from other Africa became greater than exports from Chad or Nigeria. Collectively, other Africa accounted for 13 per cent of the export market in 2016.

Crude gum arabic exports from other Africa are depicted in more detail in figure 9, where countries are categorized into two subgroups, according to average export volumes in 2014–2016. The first subgroup, labelled "medium exporters", is composed of three countries with national average export volumes between 1,000 tons and 3,000 tons per year (Cameroon, Mali and Senegal). The second group, labelled "minor exporters", is composed of 10 countries with national average export volumes below 500 tons per year (Burkina Faso, Eritrea, Ethiopia, Kenya, Mauritania, the Niger, Somalia, South Sudan, Uganda and the United Republic of Tanzania). The two subgroups followed comparable export trajectories between 1992 and 2013, but diverged significantly between 2014 and 2016: while combined exports from minor exporters remained under 2,000 tons per year, exports from medium exporters underwent rapid expansion, surpassing 12,000 tons in 2016. The recent increase in export quantities from other Africa, therefore, was due to the improved performance of Cameroon, Mali and Senegal, the three medium exporters. Export quantities for each of these countries in the period between 1992 and 2016 are depicted in figure 10.

Mali and Senegal have started to recover the important role they once played in the gum arabic market. Until the 1960s, the two countries used to be the second and third largest exporters of crude gum arabic after the Sudan, exporting more than 10,000 annual tons each. Unfavourable natural events, inadequate management of dryland ecosystems and distorting

**Figure 9** Crude gum arabic export quantities, other Africa, 1992–2016 (Tons)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

policies<sup>31</sup> nearly decimated the gum arabic sectors in these two countries. After decades of exceedingly low export quantities, generally below 500 tons per year, the first sign of recovery occurred in 2009, when Senegalese exports surpassed 1,000 tons. After some fluctuations, Senegalese exports reached 2,000 tons in 2015 and 3,500 tons in 2016. In Mali, exports reached nearly 2,500 tons in 2015 and 6,000 tons in 2016.

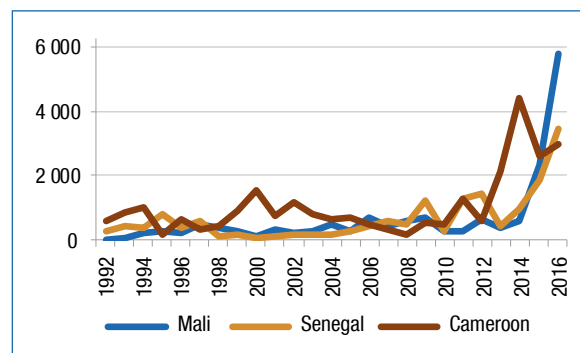
Although Cameroon possesses a domestic crude gum arabic sector, an important share of the recent surge in exports consists of re-exports of gum from Chad. Cameroonian exports, previously below 500 tons per year, were consistently above 2,000 tons in the period between 2012 and 2016. After reaching a peak of 4,500 tons in 2014, they receded to 2,500 tons in 2015 and 3,000 tons in 2016. The increase was due almost exclusively to purchases by India.<sup>32</sup>

Among minor exporters, crude gum arabic exports remained low and irregular. For example, South Sudan exported an annual average of 92 tons of gum arabic in 2014–2016, despite having a production potential estimated at 27,000 tons per year (Wani et al., 2012). Although the country is endowed with favourable natural conditions, a number of challenges hinder the full exploitation of domestic

<sup>31</sup> For example, the concession of export monopoly rights to a parastatal company in Mali – Société malienne d'importation et d'exportation (SOMIEX) – contributed to the deterioration of economic incentives for local producers and intermediaries in 1960–1974. As a result, official production and exports declined steeply, and smuggling became widespread. Despite liberalization in 1974, official exports remained low for nearly four decades.

<sup>32</sup> Most of the gum arabic exports of Cameroon consist of friable gum, of which India is the main buyer on a global scale.

**Figure 10** Crude gum arabic export quantities, medium exporters, 1992–2016 (Tons)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

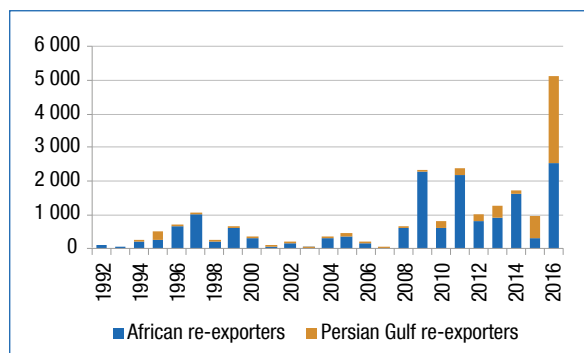
gum resources. Most notably, local communities lack awareness of the commercial value of gum arabic and knowledge of production and marketing processes. Therefore, except in northern areas bordering the Sudan, local harvesting and handling skills are poor, and participation in production is low. In other sub-Saharan African countries, such as Ethiopia, Kenya and the Niger, gum resources also remain underexploited due to the lack of proper tapping, extraction and marketing skills (Gindaba et al., 2007; Vellema et al., 2014; CIRAD, 2011). Insecurity, weak institutions and regulatory mechanisms, inadequate infrastructure and financial services, and limited access to international markets further curtail the expansion of the gum arabic sector in many African countries.

### Accounting for re-exports

Mirror import data are generally published on the basis of the country of origin, as opposed to the country of consignment.<sup>33</sup> However, importing authorities may at times fail to determine the true origin of imports, such as when an incoming shipment is reported as originating in the country from where it was shipped, instead of the country where the goods were produced. One recognizable example occurs when

<sup>33</sup> “Country of origin” refers to the country where a product is originally produced. “Country of consignment” refers to the last country from which a product is shipped, which may or may not be the country of origin. For example, consider a bag of gum arabic produced in the Sudan, exported to the United Arab Emirates and re-exported to India without any additional processing or transformation. For the first shipment, between the Sudan and the United Arab Emirates, the Sudan is both the country of origin and the country of consignment. For the second shipment, between the United Arab Emirates and India, the country of origin is the Sudan and the country of consignment is the United Arab Emirates.

**Figure 11 Crude gum arabic re-exports, by country group, 1992–2016 (Tons)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

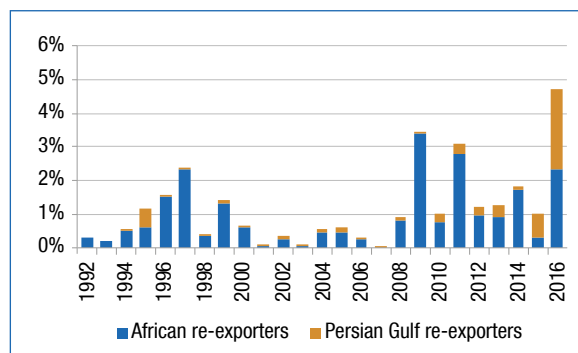
imports originate from countries that do not produce or process gum arabic on a commercial scale.

In order to account for this misreporting, mirror imports originating in two groups of countries outside the African gum belt are assumed to consist of re-exports of crude gum arabic.<sup>34</sup> These countries do not produce crude gum arabic on a commercial scale, but occasionally serve as transshipment points. The first group is composed of nine sub-Saharan African countries in the vicinity of the gum belt: Benin, the Central African Republic, Côte d'Ivoire, Djibouti, the Gambia, Ghana, Guinea, Guinea-Bissau and Togo. The second group is composed of four Persian Gulf countries: Bahrain, Qatar, Saudi Arabia and the United Arab Emirates. Estimated re-exports from these two groups are depicted in figures 11 and 12.

Re-exports of crude gum arabic were generally low between 1992 and 2007, with the exception of the mid-1990s, when annual re-exports from the Central African Republic briefly surpassed 1,000 tons. They became more preponderant after 2008, due to re-exports from countries in the Gulf of Guinea (most notably, Benin, Ghana and Togo) and the Persian Gulf (most notably, the United Arab Emirates). As a percentage of the combined quantity exported by the African gum belt countries, re-exports were particularly important in 2009 (3.4 per cent), 2011 (3.1 per cent) and 2016 (4.7 per cent). While neighbouring African countries accounted for the majority of re-exports between 1992 and 2014, the United Arab Emirates was the most important re-exporter in 2015 and 2016.

<sup>34</sup> In order to distinguish between crude and processed gums, only trade flows with unit values compatible with prevailing prices for crude gum arabic are included in the estimates.

**Figure 12 Crude gum arabic re-exports as a percentage of exports from the African gum belt, 1992–2016 (Percentage)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

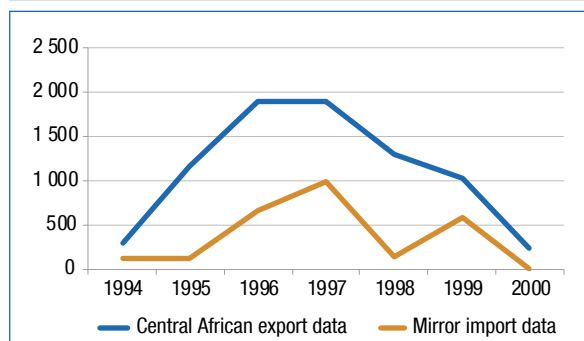
The Central African Republic in the 1990s illustrates the important role that re-exporting countries can play in the gum arabic market. Although it does not produce gum arabic within its borders,<sup>35</sup> the Central African Republic was the world's fourth-largest exporter in the mid-1990s due to re-exports of gum smuggled from the Sudan, where producer prices were low due to the official export monopoly and export tax in force at the time. After importing crude gum arabic from the Sudan free of import tariffs and taxes, three companies – Cafe Star, SIEGF and Sympes Ayas – cleaned, sorted and packaged the product in Bangui and re-exported it through the port of Douala, in Cameroon (Bonannee, 1999). A comparison of trade data reported by Central African and foreign customs authorities suggests that most gum arabic shipments arriving abroad from the Central African Republic during the 1990s were correctly classified as originating in the Sudan. While Central African data indicate an average annual export volume of 1,500 tons in 1995–1999, mirror data from trading partners indicate an average annual import volume of 500 tons from the Central African Republic in the same period. Detailed annual trade statistics, as officially reported by exporting and importing authorities, are contrasted in figure 13.<sup>36</sup>

Re-exports from countries in the vicinity of the gum belt re-emerged as a significant phenomenon in

<sup>35</sup> Although the subprefecture of Birao, in the extreme north of the Central African Republic, has a semi-arid climate propitious for acacia trees, gum arabic on a large commercial scale is not reported in the region.

<sup>36</sup> After 2000, re-exports from the Central African Republic either ceased to occur or were consistently identified by importing authorities as originating in the true country of origin. Mirror import data indicate that imports from the Central African Republic occurred in only three years in the 2001–2016 period and for very low amounts.

**Figure 13 Gum arabic exports and mirror imports, Central African Republic, 1994–2000 (Tons)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

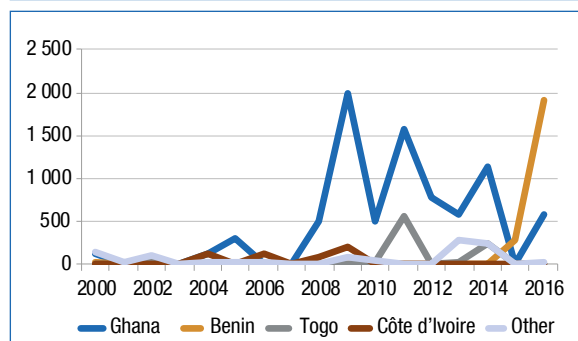
2008–2016, particularly in the Gulf of Guinea. Figure 14 summarizes mirror imports originating from these countries in 2000–2016. Almost 2,000 tons of gum arabic imports were reported to originate from Ghana in 2009, making it the world's fourth largest exporter that year, ahead of Mali and Senegal. Imports originating in Ghana remained high during most of the 2010–2016 period. Benin also became an important source of gum arabic imports in 2016, when almost 2,000 tons were imported from this country. Part of the shipments originating from countries in the Gulf of Guinea may consist of local gums from *Acacia polyacantha* or *Acacia sieberana*, which are sometimes incorrectly labelled “gum arabic”.

### Measuring export value

Since import values for most countries are reported only on a CIF basis, they must be converted to the standard FOB basis applicable to exports. This is accomplished by discounting CIF values by a freight and insurance factor.<sup>37</sup> Due to the lack of pairwise data on freight and insurance for all country combinations, and following the practice in the literature (UNCTAD, 2016b), the freight and insurance discount factor is assumed to be fixed across trading partners, but to vary over time and across product categories. Accordingly, annual average freight and insurance discount factors were calculated based on detailed official data from six countries that report imports on both CIF and FOB bases: Ecuador, New Zealand, Paraguay, the Philippines, the United States and the Bolivarian Republic of Venezuela. Estimated trade-weighted freight and insurance factors for crude and processed gum arabic for the period between

<sup>37</sup> For countries that report imports on an FOB basis, reported FOB values are used instead.

**Figure 14 Gum arabic mirror imports from countries in the vicinity of producing countries, 2000–2016 (Tons)**



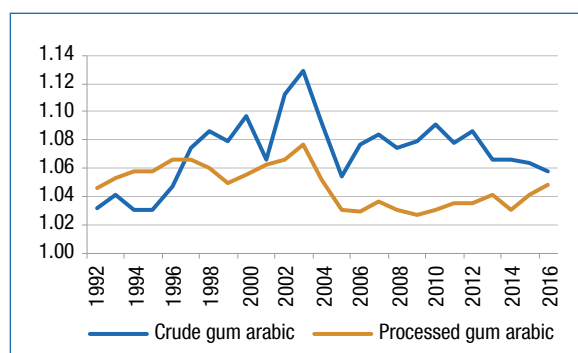
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Note: “Other” includes the Central African Republic, Djibouti, the Gambia, Guinea and Guinea-Bissau.

1992 and 2016 are summarized in figure 15. For crude gum arabic, the trade-weighted insurance and freight factor followed an upward trend between 1992 and 2003, when it increased from 1.03 to 1.13. Subsequently, the factor receded to a lower and less volatile level (annual average of 1.075 in 2004–2016). For processed gum arabic, the increase in the trade-weighted freight and insurance factor in 1992–2003 was less pronounced (from 1.045 to 1.075), but the fall in 2004–2016 was also significant (annual average of 1.035 in 2004–2016).

Estimated annual crude gum arabic export values between 1992 and 2016 are summarized in table 6 and depicted in figure 16. In addition, figure 17 illustrates market shares based on export values (as opposed to figure 8, which depicts market shares based on export quantities). Export values were generally more erratic than export quantities due to significant price volatility,

**Figure 15 Freight and insurance factors for crude and processed gum arabic, 1992–2016**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Table 6 Estimated crude gum arabic export values (FOB), by country of origin, 1992–2016 (Thousands of dollars)

Country	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Sudan	48 519	44 957	98 328	63 315	40 267	24 872	28 645	19 525	23 143	27 141	27 077	32 586	60 125
Chad	5 855	9 049	12 091	18 932	13 111	8 453	11 741	11 787	9 861	11 498	8 536	8 117	13 431
Nigeria	15 224	13 791	15 337	12 404	12 671	8 510	6 032	6 072	6 110	6 856	4 664	4 767	12 316
Mali	100	126	427	513	240	320	244	175	90	201	126	419	367
Senegal	1 176	1 572	1 615	3 662	1 467	1 679	111	162	63	125	263	305	396
Cameroon	1 443	2 666	4 600	530	472	361	315	732	1 085	497	689	288	621
Eritrea	–	0	0	759	988	1 057	427	562	703	518	242	270	191
Kenya	270	530	819	491	259	20	35	23	125	5	433	15	51
Ethiopia	156	308	906	506	164	807	64	151	154	143	93	85	166
Mauritania	112	175	708	890	489	270	22	2	137	109	0	0	1 467
United Republic of Tanzania	393	380	665	522	484	674	340	374	487	348	260	477	566
South Sudan	–	–	–	–	–	–	–	–	–	–	–	–	–
Somalia	106	11	475	98	140	81	101	117	36	9	5	4	73
Burkina Faso	0	0	0	0	1	1	13	13	0	18	0	37	62
Niger	395	822	534	188	428	114	76	78	47	76	98	64	87
Uganda	0	0	0	0	0	0	0	0	0	0	0	0	0
Producing countries (A)	73 749	74 387	136 505	102 810	71 179	47 219	48 164	39 771	42 038	47 544	42 485	47 433	89 919
African re-exports (B)	494	207	729	773	1 304	1 589	192	559	161	11	103	6	94
Persian Gulf re-exports (C)	0	0	2	160	5	1	6	28	19	25	47	21	53
Total (D=A + B + C)	74 243	74 593	137 236	103 743	72 488	48 809	48 362	40 358	42 218	47 580	42 635	47 460	90 066



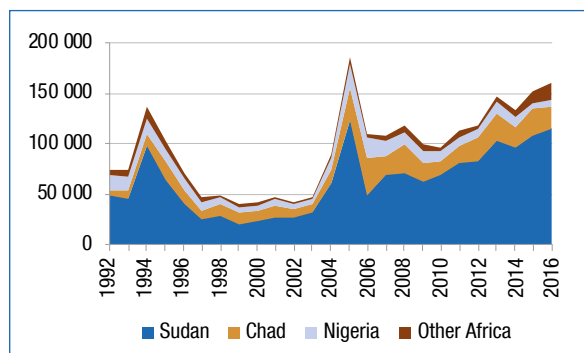
Table 6 (cont.) Estimated crude gum arabic export values (FOB), by country of origin, 1992–2016 (Thousands of dollars)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014–2016 average
Sudan	123 892	48 503	69 627	70 064	63 095	68 883	80 647	82 586	102 841	95 612	107 350	115 017	105 993
Chad	31 001	37 551	18 412	29 264	17 831	13 176	17 293	24 184	26 839	21 269	28 012	22 037	23 773
Nigeria	24 184	19 552	14 890	12 567	11 912	10 611	8 568	8 115	11 482	9 055	4 982	6 030	6 689
Mali	253	892	480	645	951	260	347	731	576	922	1 903	6 692	3 173
Senegal	946	1 533	1 524	1 483	2 292	533	2 933	1 441	1 117	1 035	2 775	4 389	2 733
Cameroon	1 125	402	248	172	881	618	2 335	624	1 764	2 906	2 077	2 187	2 390
Eritrea	2 244	144	1 425	970	620	95	402	339	312	244	2 184	2 071	1 500
Kenya	66	72	102	195	166	36	70	169	366	175	616	933	574
Ethiopia	222	65	405	1 081	517	775	327	112	577	497	620	500	539
Mauritania	611	411	332	555	116	39	420	58	178	349	358	396	368
United Republic of Tanzania	372	228	280	402	202	186	243	101	619	236	419	166	273
South Sudan	–	–	–	–	–	–	0	0	103	89	162	374	208
Somalia	381	138	309	278	57	137	81	295	253	328	126	1	152
Burkina Faso	21	51	44	23	30	19	52	94	7	152	41	0	65
Niger	72	114	83	296	25	56	27	27	248	60	30	36	42
Uganda	0	0	1	0	0	0	0	0	0	14	3	7	8
Producing countries (A)	185 393	109 658	108 162	117 994	98 694	95 423	113 742	118 743	147 282	132 942	151 658	160 836	148 479
African re-exports (B)	151	165	0	385	1 055	371	1 359	503	526	831	573	1 686	1 030
Persian Gulf re-exports (C)	85	31	34	80	10	113	185	107	155	85	473	1 899	819
Total (D=A + B + C)	185 629	109 853	108 196	118 458	99 759	95 907	115 286	119 353	147 963	133 858	152 703	164 420	150 327

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources (mirror data).

Notes: Countries are ranked according to 2014–2016 averages. Dashes indicate years prior to independence.

**Figure 16** Crude gum arabic export values (FOB), by main exporters, 1992–2016 (Thousands of dollars)



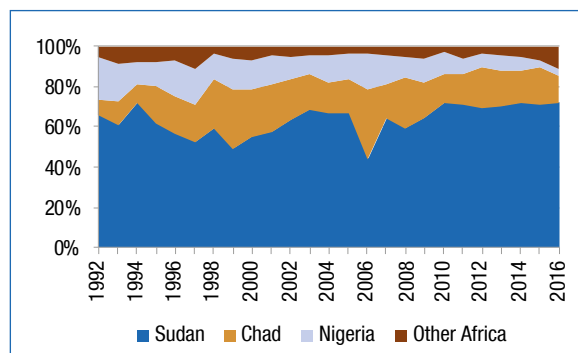
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

which is characteristic of commodity markets and poses substantial development hurdles to commodity-export-dependent developing countries (UNCTAD, 2017). World crude gum arabic export value peaked at \$137 million in 1994 and \$185.5 million in 2005, but remained under \$50 million per year during most of the intervening period. By contrast, export value followed a generally upward trend after 2010, reaching \$164 million in 2016, the second highest annual value in the 25 years under analysis.

The export market share of the Sudan in value terms is, in general, 10 percentage points higher than its corresponding export quantity market share. This is due not only to the large share of hard gum in total gum arabic exports, but also to the overall high quality of Sudanese gum, the standard against which gums from other countries are compared. Conversely, the export market share of Nigeria in value terms is, in general, 10 percentage points lower than its corresponding export quantity market share, since a large share of Nigerian exports are composed of lower-quality gums, siftings and rejects. In the case of Chad, export market shares in value terms are almost identical to export quantity market shares, as the country exports a mix of hard and friable gums.

While export market shares in value terms are higher than export quantity market shares in Senegal and Mauritania, the opposite is true in Mali and Cameroon. This reflects the different types of gum arabic primarily exported by these countries: hard gum in the case of Senegal and Mauritania, and friable gum in the case of Mali and Cameroon. Among other African producers, the United Republic of Tanzania stands out

**Figure 17** Crude gum arabic export value market shares, by main exporters, 1992–2016 (Percentage)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

for having the largest relative difference between export value and export quantity market shares, the former corresponding on average to less than half of the latter.

### Bridging the gap between exports and supply

Gum arabic exports and production may diverge due to factors such as domestic consumption, stock changes and smuggling. With the exception of the Sudan, sub-Saharan African gum-arabic-producing countries do not hold stocks. Chad and Nigeria, the two largest producers after the Sudan, reportedly held no gum arabic stocks for at least 10 and 20 years, respectively (ITC, 2008a). GAC, which was the sole authorized exporter of gum arabic from the Sudan until 2009, maintained an average stock of 15,000 tons in the 1980s and early 1990s (Iqbal, 1993). In order to compensate for recurring production shortfalls, GAC accumulated large stocks over the 1990s and 2000s, a practice that jeopardised the company's financial health. In 2007, GAC's stocks were estimated at between 25,000 tons and 30,000 tons (Couteaudier, 2007). Following the depletion of GAC's stocks due to a production shortage in 2014, Sudanese authorities attempted to establish a regional regulatory stock in conjunction with Chad and Nigeria. Nevertheless, the three countries were unable to amass the capital necessary to maintain such a stock.

Domestic consumption of crude gum arabic in sub-Saharan African producing countries is generally low, especially when compared with exports (Muller and Wata, 1998; Mallet et al., 2003; ITC, 2008a; ITC, 2010). Notable exceptions occur in Nigeria, Senegal and the Sudan, where local processors produce

spray-dried gum arabic powder and final gum arabic products for local consumption and export.

In the Sudan, domestic consumption is reported to have increased from 500 tons in 2008 to 7,000 tons in 2011 and 10,000 tons in 2014, notably fuelled by industrial demand from the beverage and confectionary sectors (Panapress, 2012; Bloomberg, 2015; El Tahir and Vishwanath, 2015). In Nigeria, industrial demand for crude gum arabic arises from the sole high-grade processing facility in the country: the Dansa Food Processing Company Limited, located in Kano. In Senegal, Valdafrique's processing facility, located in Dakar, is reported to buy on average 200 tons of crude gum arabic from local wholesalers per year (Mujawamariya, 2012).<sup>38</sup>

In addition to domestic consumption by industrial users, crude gum arabic is also consumed by gum-collecting households or sold in local markets. Despite the traditional uses discussed in chapter II, for most sub-Saharan African producers, gum arabic is principally an export crop, with limited use in native areas (Seif el Din and Zarroug, 1996). In Nigeria, producing households generally do not consume gum arabic, as the commodity is essentially produced for the market (Okafor et al., 1994). In the Niger, a survey of 560 gum collectors in three gum production regions revealed that only 7.6 per cent of the output was consumed by gum collecting households (Elhadji Seybou et al., 2016).

Official imports of crude gum arabic by African gum-producing countries are low or close to nil. With a few exceptions, most gum arabic imported by African

<sup>38</sup> Fourteen years earlier, Muller and Wata (1998) reported that approximately 200 tons of gum arabic were used in the Senegalese food and pharmaceutical industries.

countries in 1992–2016 corresponded to processed gum arabic from Europe or North America. As a result, it may be safe to assume that the crude gum arabic consumed by industrial users in Nigeria, Senegal and the Sudan was either produced domestically or smuggled from neighbouring countries.

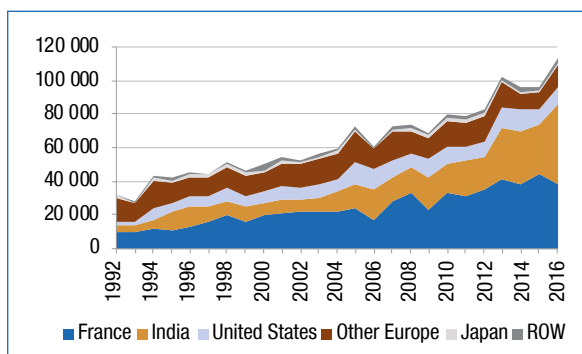
Unofficial imports are believed to be prevalent throughout the African gum arabic belt. The cases of Sudanese gum smuggled through the Central African Republic and Cameroonian gum smuggled through Nigeria, both described in chapter III, are just two of many examples. Other alleged cases of smuggling abound: Burkinabe gum smuggled into Mali and the Niger; Chadian gum smuggled into Nigeria; Malian and Mauritanian gums smuggled into Senegal; and Sudanese gum smuggled into Chad, Eritrea and Ethiopia.

## B. CRUDE GUM ARABIC IMPORTS

Crude gum arabic imports are characterized by a strong and rising level of concentration. The two largest importing countries, France and India, accounted for 75 per cent of world import quantities in 2014–2016, compared with 44 per cent in 1992–1994. The other traditional importers – the United States, Japan and the rest of Europe – saw their combined market share decline by more than half, from 54 per cent in 1992–1994 to 23 per cent in 2014–2016. Crude gum arabic import quantities for key importing countries and regions are summarized in table 7 and depicted in figure 18. In addition, figure 19 illustrates market shares based on import quantities.

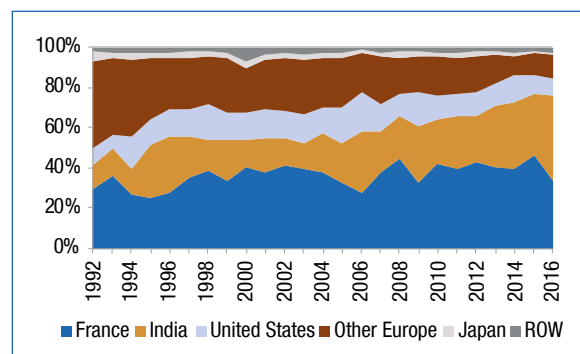
The import quantity market share of India has been converging to that of France, the main importer. While

**Figure 18 Crude gum arabic import quantities, by main importers, 1992–2016 (Tons)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 19 Crude gum arabic import quantity market shares, by main importers, 1992–2016 (Percentage)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Table 7 Crude gum arabic import quantities, by country or region of destination, 1992–2016 (Tons)

Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
France	9 499	10 169	11 748	10 351	12 454	15 887	19 913	15 429	20 071	20 590	21 558	22 436	22 344
India	3 855	3 781	5 561	11 240	12 532	9 210	7 785	9 594	6 880	8 944	7 029	7 448	11 637
United States	2 632	2 025	6 811	5 359	6 447	6 079	8 949	6 344	6 835	7 780	7 445	8 250	7 699
Germany	4 081	2 871	4 350	4 499	2 557	3 161	3 011	3 665	4 226	5 013	3 932	4 629	6 019
United Kingdom	6 875	4 415	4 660	4 117	4 077	4 707	5 103	1 910	3 572	3 281	4 354	5 903	5 195
Italy	1 092	2 040	5 169	2 160	1 734	699	639	2 097	1 147	2 013	1 385	1 550	1 613
Japan	1 676	761	1 447	1 071	1 141	1 380	1 580	1 246	1 689	1 724	1 081	1 799	1 536
China	0	0	34	104	50	0	199	184	420	480	321	286	415
Belgium	80	123	460	330	124	531	546	435	529	930	1 151	790	978
Slovakia	–	0	0	0	0	0	0	0	0	0	0	1	0
Rest of the world	2 500	1 957	3 250	2 690	4 099	3 175	3 597	5 303	4 732	3 419	4 305	3 702	2 281
<i>By region:</i>													
Europe	23 512	20 879	28 385	23 077	23 757	27 259	32 107	27 735	31 303	33 909	35 484	37 504	37 318
Asia and the Pacific	5 934	5 048	7 952	13 014	14 529	11 097	10 052	11 655	9 773	11 999	9 167	10 679	14 354
North America	2 642	2 029	6 851	5 364	6 447	6 079	8 949	6 344	6 835	7 783	7 445	8 268	7 699
Middle East and North Africa	56	118	104	85	77	39	115	286	273	297	227	201	193
Latin America and the Caribbean	104	54	169	143	268	211	99	156	174	163	185	241	114
Sub-Saharan Africa	41	13	29	237	137	144	1	32	1 741	23	53	61	39
Total	32 290	28 142	43 490	41 920	45 215	44 828	51 323	46 207	50 100	54 173	52 560	56 954	59 715

Table 7 (cont.) Crude gum arabic import quantities, by country or region of destination, 1992–2016 (Tons)

Country or region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
France	24 151	17 070	27 646	32 933	22 487	33 313	31 575	35 273	40 795	38 172	44 422	38 224	40 273
India	13 870	18 588	14 853	15 749	19 430	17 527	20 968	19 472	31 278	31 844	29 247	47 559	36 217
United States	12 999	11 524	9 772	8 033	11 292	9 772	8 494	9 334	11 750	12 737	9 014	10 209	10 653
Germany	6 073	4 227	4 423	5 127	3 546	4 637	4 408	3 204	4 748	5 056	4 812	4 963	4 944
United Kingdom	7 598	2 403	6 415	3 388	5 343	6 213	6 124	6 211	6 460	2 050	3 006	3 110	2 722
Italy	2 623	1 717	2 266	2 061	1 833	1 514	1 729	1 783	1 739	1 235	2 573	2 585	2 131
Japan	1 467	819	1 654	2 068	1 629	1 501	2 068	1 753	1 344	1 604	874	1 267	1 248
China	568	341	795	317	495	1 226	1 258	744	599	698	738	1 620	1 018
Belgium	367	507	565	785	495	448	691	695	461	390	186	1 001	526
Slovakia	0	1	1	0	0	0	0	0	0	0	0	1 323	441
Rest of the world	3 527	3 686	4 679	3 192	2 278	3 442	2 061	4 271	3 004	2 287	1 463	1 522	1 757
<i>By region:</i>													
Europe	42 723	29 071	44 905	46 119	35 188	48 683	45 772	50 308	55 804	47 315	55 204	51 434	51 318
Asia and the Pacific	16 459	20 018	17 515	18 465	21 884	20 622	24 535	22 257	33 832	34 340	31 178	50 852	38 790
North America	12 999	11 524	9 772	8 093	11 312	9 832	8 579	9 381	11 830	12 784	9 041	10 332	10 719
Middle East and North Africa	915	183	705	778	289	323	288	354	505	1 076	669	652	799
Latin America and the Caribbean	135	82	158	158	110	83	140	138	182	347	228	85	220
Sub-Saharan Africa	12	3	12	41	46	50	63	302	23	210	15	26	84
Total	73 242	60 881	73 068	73 654	68 828	79 593	79 376	82 739	102 177	96 072	96 334	113 382	101 929

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Notes: Countries are ranked according to 2014–2016 averages. Dashes indicate years prior to independence.

Table 8 Crude gum arabic import values (FOB), by country or region of destination, 1992–2016 (Thousands of dollars)

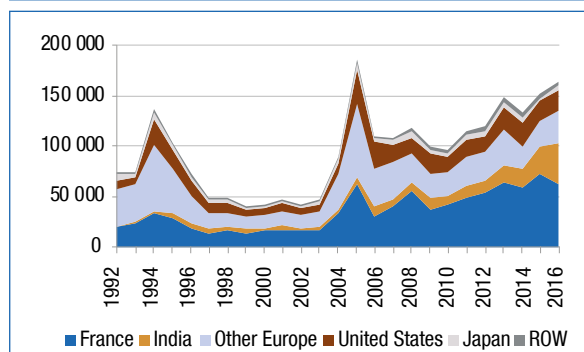
Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
France	19 277	23 835	33 367	27 899	17 973	13 867	17 055	13 780	16 183	16 816	16 038	17 201	32 915
India	1 320	1 093	2 121	5 664	5 637	3 676	3 332	4 172	2 664	4 117	2 840	2 869	4 479
United States	8 295	6 366	24 760	18 668	15 850	9 597	10 174	7 568	6 977	7 897	6 550	7 519	11 289
Germany	9 525	8 283	12 807	13 618	4 573	4 084	3 157	3 513	4 479	4 774	3 697	4 918	13 253
United Kingdom	17 347	13 206	16 328	12 935	7 778	5 010	5 094	1 685	3 296	2 871	3 356	4 485	10 861
Italy	4 051	10 521	26 117	8 934	4 888	1 089	919	2 535	1 384	2 436	1 390	1 558	3 910
Japan	6 309	3 892	6 814	4 760	3 269	3 165	2 765	1 905	2 421	2 555	1 646	2 673	4 680
China	0	0	10	66	28	0	159	116	337	281	141	192	278
Slovakia	–	0	0	0	0	0	0	0	0	0	0	4	0
Belgium	270	491	2 319	1 222	271	835	670	566	595	1 101	1 294	819	2 830
Rest of the world	7 849	6 908	12 595	9 977	12 221	7 485	5 037	4 518	3 881	4 733	5 682	5 221	5 571
<i>By region:</i>													
Europe	56 371	61 074	99 690	71 972	44 147	29 953	30 890	25 419	28 343	31 156	29 666	32 326	67 396
Asia and the Pacific	8 977	6 648	11 440	11 925	10 828	7 785	6 884	6 868	6 265	7 952	5 392	6 817	10 650
North America	8 365	6 394	25 043	18 683	15 850	9 597	10 174	7 568	6 978	7 902	6 551	7 520	11 289
Middle East and North Africa	142	137	132	108	149	98	191	262	225	222	272	301	314
Latin America and the Caribbean	282	272	787	900	1 338	1 285	223	231	308	331	297	420	313
Sub-Saharan Africa	106	69	144	156	175	90	1	10	98	18	458	76	104
Total	74 243	74 593	137 236	103 743	72 488	48 809	48 362	40 358	42 218	47 580	42 635	47 460	90 066

Table 8 (cont.) Crude gum arabic import values (FOB), by country or region of destination, 1992–2016 (Thousands of dollars)													
Country or region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
France	61 591	29 942	39 766	55 668	36 697	41 109	48 704	54 355	63 264	59 089	73 207	61 762	64 686
India	8 193	10 542	8 017	8 810	11 194	9 975	11 534	10 524	18 230	18 602	25 878	41 758	28 746
United States	32 964	27 144	17 326	15 786	19 730	15 366	17 101	15 078	22 496	22 618	19 646	19 951	20 738
Germany	24 615	12 298	9 545	10 876	6 971	6 673	9 794	6 808	10 413	12 250	11 620	11 997	11 956
United Kingdom	26 845	4 438	10 535	6 594	9 539	8 053	10 538	8 895	13 317	4 803	6 923	6 935	6 221
Italy	11 610	5 679	4 834	4 311	3 724	2 340	3 238	3 912	4 539	2 949	6 210	6 367	5 175
Japan	6 834	2 942	4 345	6 374	4 495	3 885	6 124	5 354	4 381	5 411	3 029	4 030	4 156
China	787	439	584	458	812	1 409	1 423	736	863	1 067	1 809	1 304	1 394
Slovakia	0	12	31	0	0	0	0	0	0	0	0	3 764	1 255
Belgium	933	1 638	1 342	1 704	913	663	1 450	1 705	1 097	929	313	2 309	1 184
Rest of the world	11 256	14 778	11 871	7 878	5 684	6 435	5 382	11 986	9 362	6 141	4 068	4 244	4 817
<i>By region:</i>													
Europe	134 159	66 857	76 034	84 210	61 380	63 399	77 088	84 605	97 716	81 460	99 024	93 936	91 473
Asia and the Pacific	17 261	14 819	13 529	16 591	17 416	16 012	19 697	17 859	25 811	25 735	31 730	48 186	35 217
North America	32 966	27 144	17 326	15 962	19 802	15 552	17 369	15 233	22 721	22 784	19 741	20 258	20 928
Middle East and North Africa	602	519	790	913	516	519	556	778	1 101	2 373	1 703	1 644	1 907
Latin America and the Caribbean	618	510	506	761	608	351	481	565	576	904	481	319	568
Sub-Saharan Africa	23	3	10	21	37	75	95	312	38	602	24	77	235
Total	185 629	109 853	108 196	118 458	99 759	95 907	115 286	119 353	147 963	133 858	152 703	164 420	150 327

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Notes: Countries are ranked according to 2014–2016 averages. Dashes indicate years prior to independence.

**Figure 20** Crude gum arabic import values (FOB), by main importers, 1992–2016 (Thousands of dollars)

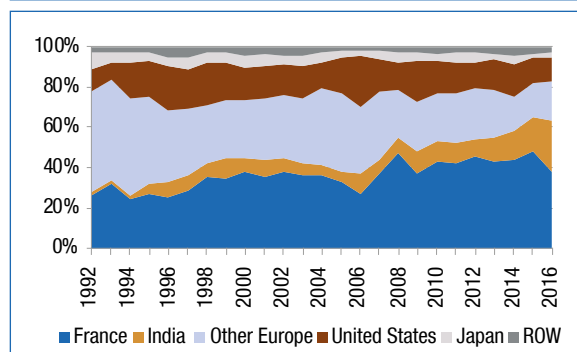


Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

the share of India went from 13 per cent in 1992–1994 to 35 per cent in 2014–2016, that of France went 31 per cent to 40 per cent in the same period. The rapid expansion in the market share of India coincided with a substantial reduction in the relative importance of other traditional crude gum arabic importers. The United States, Japan and the rest of Europe saw their combined market share more than halve, from 54 per cent in 1992–1994 to 23 per cent in 2014–2016. The import market share held by the rest of the world (ROW) remained low. Most notable among the ROW was China, which saw average annual imports increase from 11 tons in 1992–1994 to 1,000 tons in 2014–2016.

Crude gum arabic imports are strongly segmented according to botanical source and quality. European countries, the United States and Japan generally import *Acacia senegal* gum, which is cleaned, sorted and graded in the country of origin prior to export. On the other hand, India imports mostly bulk, uncleaned and unsorted *Acacia seyal* gum, siftings and rejects, as well as gums from other species that are not officially recognized by JECFA as bearers of gum arabic. As prices for different types of crude gum arabic vary significantly (see chapter V), so do import values and import value market shares by country. Crude gum arabic import values for the 10 main importing countries and ROW in 1992–2016, as well as a breakdown by geographical region, are presented in table 8. In addition, figures 20 and 21 illustrate import values and import value market shares for leading importers and ROW. Data are presented on a FOB basis, according to the methodology described in the previous section.

**Figure 21** Crude gum arabic import value market shares, by main importers, 1992–2016 (Percentage)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

The leadership of France in the crude gum arabic market becomes more discernible when the focus of the analysis shifts from import quantities to import values. French crude gum arabic imports increased from an annual average of \$25.5 million in 1992–1994 to \$64.5 million in 2014–2016. Concomitantly, the country's import value market share expanded from 27 per cent to 43 per cent. While the average import quantities of France and India in 2012–2014 were relatively comparable, French import values were more than twice as high as those of India.

A leading processor and re-exporter of gum arabic since the Gum Wars of the eighteenth century, France solidified its market leadership between 1992 and 2016. French manufacturers accounted for 63 per cent of world processed gum arabic exports in 2014–2016, compared with 45 per cent in 1992–1996 (see chapter IV.C). Thus, French imports of crude gum arabic are intrinsically tied to the commercial success of its manufacturers.

Although a far contender, India is the second most important market for crude gum arabic. As Indian imports increased from \$1.5 million per year in 1992–1994 to \$28.5 million per year in 2014–2016, the country's import value market share expanded from 2 per cent to 19 per cent. Since Indian consumers are more price sensitive than European or North American consumers, crude gum imported by India is often of lower quality.

The relative importance of other Europe in the crude gum arabic market declined remarkably between 1992 and 2016. The combined import value market share of all European countries with the exception



of France dropped from 50 per cent in 1992–1994 to 18 per cent in 2014–2016. The decline was particularly strong in the United Kingdom (from 18 per cent to 4 per cent), Italy (from 13 per cent to 3 per cent) and Scandinavia (from 6 per cent to less than 0.1 per cent). Combined imports from Denmark, Finland, Norway and Sweden fell from an annual average of \$5.6 million in 1992–1994 to \$91,000 in 2014–2016. In particular, Denmark and Sweden, which used to import crude gum arabic for applications in the confectionary industry, did not record any imports in 2014–2016. Conversely, a dramatic increase in imports was observed in Slovakia: from virtually no imports in 1992–2015 to \$3.75 million in 2016.

The United States is the third largest individual importer of crude gum arabic. Although average annual imports increased from \$13 million in 1992–1994 to \$21 million in 2014–2016, import value market share expanded only slightly, from 13 per cent to 14 per cent. Conversely, imports of Japan dropped from \$5.7 million to \$4.1 million in the same period, and the corresponding import value market share declined from 6 per cent to 3 per cent. Most other countries imported low values of crude gum arabic, as preference was given to imports of processed gum.

### C. PROCESSED GUM ARABIC EXPORTS

Processed gum arabic export quantities and values between 1992 and 2016 are summarized in tables 9 and 10 and depicted in figures 22 and 24. In addition, figures 23 and 25 illustrate export market shares in the same period.

World processed gum arabic exports reached an annual average value of \$192 million in 2014–2016, approximately 28 per cent higher than the corresponding value for crude gum arabic in the same period (\$150 million). In terms of quantities, however, processed gum exports were nearly half as high as crude gum exports in this triennium (53,000 tons vs. 102,000 tons), which reflects the higher average unit value of processed gum (\$3.62 per kilogram vs. \$1.47 per kilogram).

Between 1992 and 2016, processed gum export values not only grew at a lower AAGR than crude gum exports (5.4 per cent vs. 8.4 per cent), but also experienced less volatility, as measured by the standard deviations of year-on-year export value

(0.15 vs. 0.36). The higher AAGR for crude gum was due in large part to the rapidly growing imports of India, which were processed and consumed chiefly in the domestic market, therefore re-entering the international market as processed gum in modest amounts.

The processed gum sector is marked by strong concentration in terms of supply, but greater dispersion in terms of demand. The largest exporter, France, accounted for 69 per cent of total exported quantities in 2014–2016. The five largest exporters of processed gum arabic – all of which are developed countries (France, the United Kingdom, Italy, the United States and Germany) – accounted for 92 per cent of export quantities in 2014–2016. The sixth largest exporter, the Sudan, accounted for an additional 4 per cent of export quantities (but only 2 per cent of the total export value).

The processed gum arabic market is also marked by high heterogeneity in terms of product sophistication, value addition and prices. While exports of the Sudan consist mostly of mechanically powdered gum, with relatively low value added,<sup>39</sup> Europe and the United States export gum arabic with high and defined levels of functionality, often traded under proprietary brands, which accrue substantially higher prices. In 2014–2016, average export unit values were relatively high for the United Kingdom (\$5.07 per kilogram), Germany (\$4.43 per kilogram) and the United States (\$4.36 per kilogram), moderate for France (\$3.46 per kilogram), and relatively low for Italy (\$2.27 per kilogram) and the Sudan (\$1.95 per kilogram).

<sup>39</sup> The Sudan has produced kibbled gum and mechanically powdered gum since the 1990s and spray-dried gum since 2003. Further development of processed gum arabic with high added value is limited by the low marketing capacity of domestic processors (Cousteaudier, 2007). In addition, Nigeria and Senegal each have one high-grade gum arabic processing facility: Dansa Food Processing Company Limited, in Kano, and Valdafrique, in Dakar. Established in 1999, Dansa operates the first spray-dried gum arabic production facility in Africa, which reached full commercial status in 2003. The majority of the gum powder produced by Dansa is exported. Founded in 1943, Valdafrique processes gum arabic into final products for the local and regional markets, such as sweets and medical tablets, and exports raw and spray-dried gum powder to Europe and Brazil. Value added processing and industrial uses remain undeveloped in most other countries in the African gum belt (Feleke and Melaku, 2011; Munyua and Muga, 2011).

Table 9 Processed gum arabic export quantities, by country or region of origin, 1992-2016 (Tons)

Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
France	7 337	8 241	9 380	9 168	9 298	11 935	13 389	14 544	15 544	16 714	17 729	17 663	18 887
United Kingdom	5 742	4 487	4 034	3 797	2 977	4 783	3 492	4 495	3 223	3 241	5 480	5 491	4 188
Italy	50	75	178	169	166	151	91	83	156	549	288	419	926
United States	830	793	1 364	1 472	2 057	2 365	1 875	1 508	1 453	1 709	1 917	1 641	1 843
Germany	2 199	2 259	2 791	3 043	2 536	1 721	2 505	2 687	2 986	2 891	2 868	3 480	3 253
Sudan	..	..	..	..	..	..	..	..	..	624	596	517	903
India	80	83	8	235	62	27	77	49	221	236	75	116	167
Netherlands	35	109	91	73	59	112	84	113	116	140	202	465	694
Belgium	75	76	143	85	186	301	941	1 457	1 271	959	1 099	1 761	1 951
Sweden	3	1	31	4	4	4	3	1	51	4	46	65	1
Rest of the world	283	209	227	1'390	136	360	264	544	668	610	792	1 536	1 092
<i>By region:</i>													
Europe	15 598	15 309	16 709	16 539	15 258	19 104	20 609	23 466	23 475	24 641	27 894	29 970	30 176
North America	830	800	1 375	1 472	2 058	2 365	1 875	1 509	1 453	1 709	1 917	1 641	1 844
Sub-Saharan Africa	0	2	0	1	2	15	3	1	37	634	613	630	905
Asia and the Pacific	200	178	86	288	93	187	173	428	339	646	410	607	459
Latin America and the Caribbean	1	38	9	24	10	6	13	55	343	46	78	74	120
Middle East and North Africa	5	7	68	1 112	61	81	49	21	41	0	180	233	399
Total	16 634	16 334	18 247	19 435	17 482	21 758	22 721	25 481	25 689	27 676	31 092	33 154	33 903

Table 9 (cont.) Processed gum arabic export quantities, by country or region of origin, 1992–2016 (Tons)

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
France	17 745	19 689	22 764	23 439	22 940	27 758	28 188	31 375	33 131	35 269	39 069	35 181	36 506
United Kingdom	5 532	5 963	5 625	5 587	4 916	5 948	5 981	6 210	5 508	4 243	4 324	4 006	4 191
Italy	778	677	755	1 139	1 388	1 409	1 589	1 932	2 385	2 490	2 949	3 177	2 872
United States	2 647	3 159	2 931	3 333	3 604	3 982	4 389	3 926	3 375	2 956	2 939	2 416	2 770
Germany	3 033	3 450	3 239	2 904	2 453	2 848	2 810	2 179	2 278	2 732	2 595	2 440	2 589
Sudan	613	795	1 229	1 141	1 185	1 578	1 883	1 538	1 961	1 955	1 979	2 232	2 055
India	69	51	98	1 346	765	880	653	414	472	492	467	218	393
Netherlands	239	624	519	542	735	1 071	776	332	330	136	526	281	314
Belgium	2 310	549	600	578	527	749	1 045	961	468	244	161	358	254
Sweden	1	3	6	1	0	4	2	0	1	663	0	2	222
Rest of the world	1 788	723	829	779	1 216	1 361	1 959	833	1 126	944	804	1 024	924
<i>By region:</i>													
Europe	29 787	31 153	33 814	34 471	33 249	40 338	41 467	43 261	44 389	46 014	49 991	45 750	47 252
North America	2 647	3 159	2 934	3 402	3 638	4 029	4 421	3 963	3 401	2 958	2 943	2 417	2 773
Sub-Saharan Africa	682	830	1 234	1 149	1 198	1 604	2 232	1 625	2 105	2 195	1 994	2 445	2 212
Asia and the Pacific	1 120	216	302	1 540	1 062	1 307	1 066	707	1 029	807	675	374	619
Latin America and the Caribbean	157	50	104	88	104	68	67	123	86	90	126	274	163
Middle East and North Africa	363	274	207	141	478	242	23	22	24	58	82	81	74
Total	34 755	35 683	38 595	40 790	39 728	47 588	49 275	49 702	51 034	52 124	55 812	51 336	53 092

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Notes: Countries are ranked according to 2014–2016 averages. Figures for the Sudan are estimates.

Table 10 Processed gum arabic export values (FOB), by country or region of origin, 1992–2016 (Thousands of dollars)

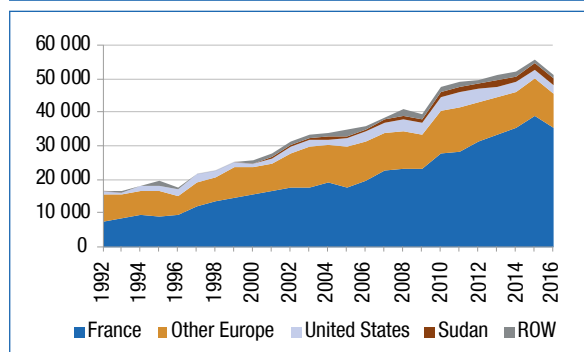
Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
France	25 895	33 138	45 629	44 086	34 696	33 733	35 423	36 983	37 117	38 713	38 325	41 773	60 090
United Kingdom	23 841	22 091	18 607	15 747	12 177	12 465	7 859	10 076	6 878	6 763	11 146	12 872	17 525
United States	3 770	3 629	7 494	8 244	9 951	8 530	5 500	5 427	4 762	4 310	5 154	4 871	5 682
Germany	8 960	10 489	12 319	12 968	8 937	4 806	6 467	6 807	6 407	6 667	6 584	8 898	12 894
Italy	204	322	728	482	467	415	230	150	284	812	428	879	1 665
Sudan	..	..	..	..	..	..	..	..	..	1 007	904	620	1 584
Netherlands	124	512	350	563	476	569	616	724	613	658	817	1 654	2 269
India	181	213	14	258	119	50	96	94	418	1 000	315	348	834
Sweden	4	22	138	29	29	26	13	2	131	16	86	134	2
Belgium	308	319	697	340	928	703	1 583	2 225	1 656	1 428	1 653	2 179	4 074
Rest of the world	1 053	1 153	1 075	1 814	847	1 023	785	1 006	1 248	1 186	2 054	2 645	3 126
<i>By region:</i>													
Europe	59 980	67 284	78 869	74 961	57 995	53 256	52 604	57 286	53 632	55 385	59 977	69 544	99 514
North America	3 771	3 664	7 571	8 244	9 962	8 530	5 500	5 432	4 762	4 310	5 154	4 871	5 687
Sub-Saharan Africa	1	7	5	9	8	43	7	5	20	1 027	929	656	1 596
Asia and the Pacific	581	632	371	579	295	332	290	477	623	1 689	963	1 280	1 912
Latin America and the Caribbean	4	274	46	92	48	12	59	255	408	147	276	272	449
Middle East and North Africa	1	28	189	646	319	148	113	38	70	1	170	250	586
Total	64 339	71 889	87 051	84 532	68 627	62 321	58 573	63 493	59 514	62 559	67 468	76 873	109 745

Table 10 (cont.) Processed gum arabic export values (FOB), by country or region of origin, 1992–2016 (Thousands of dollars)													
Country or region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
France	88 126	83 680	87 033	92 143	87 964	95 900	104 559	114 902	121 385	128 848	128 974	120 861	126 228
United Kingdom	26 354	32 778	27 495	23 628	21 858	26 663	26 704	31 752	28 821	23 378	21 483	18 876	21 246
United States	11 574	16 460	11 920	13 365	15 097	14 930	17 495	17 724	14 817	12 452	12 817	10 982	12 083
Germany	17 597	18 026	15 089	13 168	11 247	11 844	13 067	10 714	10 289	12 337	11 127	10 954	11 473
Italy	2 455	1 712	1 892	3 197	3 357	3 526	4 527	4 619	5 473	5 681	6 686	7 171	6 513
Sudan	2 654	2 691	2 636	2 653	2 389	3 211	1 369	3 127	3 894	3 620	4 064	4 355	4 013
Netherlands	1 346	2 199	2 105	2 274	2 512	3 930	2 935	1 425	1 550	976	4 440	2 494	2 637
India	244	189	265	4 638	2 201	3 173	3 579	1 546	2 443	2 810	2 494	1 030	2 111
Sweden	4	13	13	23	0	71	10	1	12	2 175	0	26	734
Belgium	8 757	2 333	2 637	2 063	1 467	1 982	2 920	5 087	1 416	686	412	1 025	708
Rest of the world	3 081	2 635	3 826	3 727	4 315	3 939	3 676	4 195	4 807	4 369	4 107	4 086	4 187
<i>By region:</i>													
Europe	145 444	141 803	137 605	138 384	129 791	144 941	155 874	170 022	170 506	175 467	174 742	162 819	171 009
North America	11 574	16 462	11 935	13 675	15 259	15 176	17 601	17 860	14 936	12 459	12 833	10 987	12 093
Sub-Saharan Africa	2 727	2 733	2 654	2 671	2 469	3 319	1 473	3 613	4 554	4 810	4 143	5 330	4 761
Asia and the Pacific	1 403	828	1 161	5 613	3 799	4 856	5 559	3 079	4 476	3 978	3 980	1 858	3 272
Latin America and the Caribbean	379	249	354	325	463	235	215	374	358	451	623	670	581
Middle East and North Africa	665	641	1 202	211	627	642	119	146	76	166	282	273	240
Total	162 192	162 716	154 910	160 879	152 407	169 170	180 842	195 093	194 905	197 331	196 604	181 937	191 957

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

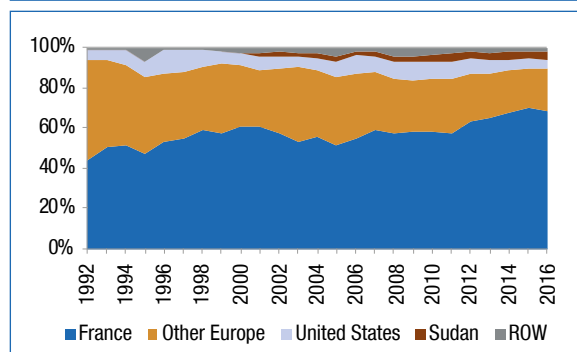
Notes: Countries are ranked according to 2014–2016 averages. Figures for the Sudan are estimates.

**Figure 22** Processed gum arabic export quantities, by main exporters, 1992–2016 (Tons)



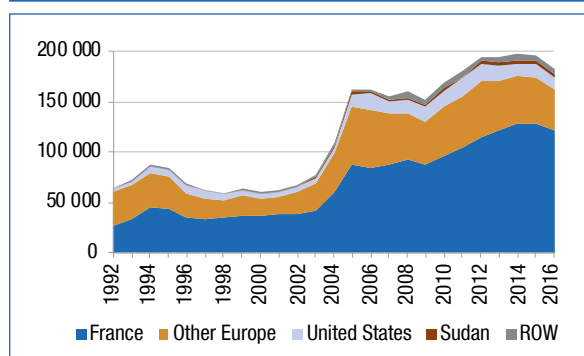
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 23** Processed gum arabic export quantity market shares, by main exporters, 1992–2016 (Percentage)



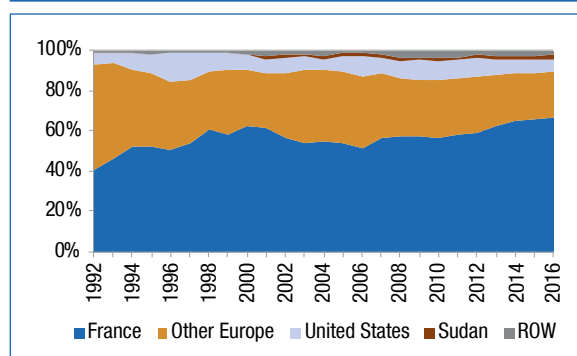
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 24** Processed gum arabic export values, by main exporters, 1992–2016 (Thousands of dollars)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 25** Processed gum arabic export value market shares, by main exporters, 1992–2016 (Percentage)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

World supply of processed gum arabic is composed not only of exports, but also of gum that is processed and consumed domestically. For example, in France, large gum arabic manufacturers normally derive between 10 and 15 per cent of their turnover from domestic sales. Consequently, estimates of domestic sales of French processed gum arabic are between \$14 million and \$22 million per year in 2014–2016. While European manufacturers tend to export a large share of their

output, processors in the United States and India sell mostly to their respective domestic markets.

#### D. PROCESSED GUM ARABIC IMPORTS

Processed gum arabic import quantities and values between 1992 and 2016 are summarized in tables 11 and 12 and depicted in figures 26 and 28. In addition, figures 27 and 29 illustrate corresponding market shares in the same period.

Table 11 Processed gum arabic mirror import quantities, by country or region of destination, 1992–2016 (Tons)													
Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
United States	3 280	3 535	3 633	3 542	3 782	5 146	5 654	6 028	5 519	6 163	7 044	6 776	7 009
United Kingdom	2 041	2 133	2 383	2 414	1 822	2 066	2 691	2 788	2 395	2 221	2 335	2 479	2 346
Germany	756	624	649	629	564	753	853	967	1 501	1 606	1 476	1 458	1 702
Brazil	157	176	337	358	378	341	401	549	699	712	954	942	1 024
China	20	8	114	219	132	198	306	309	208	524	401	1 051	708
France	1 256	1 038	1 058	1 706	567	1 114	902	1 398	713	649	1 119	1 912	2 045
Italy	650	1 175	840	755	714	1 455	1 541	1 681	2 051	2 433	1 880	2 209	2 048
Ireland	496	417	1 071	792	1 379	1 276	665	529	689	424	298	380	316
Switzerland	1 041	1 052	893	1 041	858	724	1 076	952	1 043	935	1 493	1 156	1 171
Netherlands	491	357	464	447	327	479	606	1 222	1 195	1 124	1 518	1 449	1 413
Rest of the world	6 446	5 819	6 806	7 531	6 960	8 207	8 026	9 056	9 677	10 885	12 574	13 343	14 121
<i>By region:</i>													
Europe	9 461	9 048	10 101	10 670	8 777	11 301	11 673	13 497	13 593	13 622	16 246	16 260	16 192
Asia and the Pacific	1 938	1 900	2 243	2 681	2 240	2 467	2 422	2 701	2 605	3 603	3 345	4 706	4 696
North America	3 548	3 764	3 790	3 627	3 879	5 226	5 699	6 085	5 593	6 233	7 208	6 833	7 195
Latin America and the Caribbean	1 131	1 103	1 334	1 618	1 595	1 611	1 755	2 056	2 638	2 536	2 911	3 287	3 948
Middle East and North Africa	229	295	456	435	628	559	629	740	731	927	819	1 292	1 059
Sub-Saharan Africa	328	224	323	404	363	593	544	401	528	756	564	776	813
Total	16 634	16 334	18 247	19 435	17 482	21 758	22 721	25 481	25 689	27 676	31 092	33 154	33 903

Table 11 (cont.) Processed gum arabic mirror import quantities, by country or region of destination, 1992–2016 (Tons)

Country or region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
United States	4 755	6 208	6 283	5 306	5 484	6 171	6 291	7 149	7 794	7 673	7 917	7 800	7 797
United Kingdom	2 974	2 598	2 410	2 425	2 755	3 268	3 953	3 628	3 318	3 421	3 724	3 583	3 576
Germany	2 359	2 132	1 822	2 054	1 758	2 530	2 455	2 304	2 313	2 510	2 921	2 849	2 760
Brazil	1 020	1 271	1 068	1 382	1 371	1 601	1 351	1 822	1 970	1 677	5 146	1 426	2 750
China	1 104	1 126	1 550	1 769	2 233	2 478	3 196	3 353	3 346	3 321	2 780	1 632	2 577
France	1 790	1 139	1 553	1 454	1 064	1 192	1 366	1 798	2 431	2 441	2 328	2 329	2 366
Italy	1 871	1 952	2 013	1 927	1 733	2 491	2 522	2 238	2 640	2 485	2 491	2 037	2 338
Ireland	1 195	2 027	1 611	2 189	1 619	2 439	2 151	2 162	2 276	2 579	2 152	2 222	2 318
Switzerland	1 290	1 666	2 208	2 017	1 348	1 657	1 819	1 621	1 638	1 772	1 879	1 747	1 799
Netherlands	1 577	1 587	1 722	1 749	1 838	2 004	1 946	1 821	1 901	1 845	1 809	1 701	1 785
Rest of the world	14 821	13 975	16 355	18 518	18 525	21 757	22 225	21 804	21 407	22 398	22 666	24 015	23 026
<i>By region:</i>													
Europe	18 654	19 194	20 134	21 513	19 725	23 586	24 002	23 617	23 916	25 586	26 165	25 703	25 818
Asia and the Pacific	5 608	4 781	5 759	7 519	7 361	8 381	10 004	9 717	9 924	9 986	9 478	8 968	9 478
North America	5 005	6 443	6 515	5 612	5 928	6 612	6 867	7 618	8 306	8 151	8 458	8 402	8 337
Latin America and the Caribbean	3 456	3 683	4 033	4 113	4 235	5 314	4 968	5 558	5 365	5 024	8 751	4 848	6 208
Middle East and North Africa	1 190	1 047	1 515	1 616	1 725	2 848	2 448	2 284	2 505	2 562	2 199	2 254	2 338
Sub-Saharan Africa	842	535	639	418	754	846	985	907	1 018	813	761	1 167	913
Total	34 755	35 683	38 595	40 790	39 728	47 588	49 275	49 702	51 034	52 124	55 812	51 336	53 092

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources (mirror data).

Note: Countries are ranked according to descending 2014–2016 averages.



Table 12 Processed gum arabic mirror import values (FOB), by country or region of destination, 1992–2016 (Thousands of dollars)													
Country or region	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
United States	10 608	10 315	14 297	12 087	10 891	12 334	12 776	13 857	12 416	12 741	14 417	14 517	20 813
Ireland	1 849	1 950	6 478	4 638	8 117	3 692	2 264	1 755	2 323	1 290	883	1 130	1 009
United Kingdom	7 767	8 351	10 482	11 104	6 713	5 657	5 715	6 925	5 179	4 142	4 698	4 602	7 189
Germany	2 985	3 227	2 936	3 126	2 157	2 102	2 147	2 258	2 898	3 205	3 010	3 449	6 217
China	136	57	393	482	525	551	852	945	591	1 229	1 073	3 135	2 343
Brazil	649	709	1 563	1 535	1 484	1 117	1 114	1 552	1 912	1 640	2 206	2 289	3 100
Switzerland	3 718	5 503	5 162	5 874	3 445	2 442	3 123	2 944	2 557	2 253	3 551	3 073	5 223
Italy	3 013	6 732	4 226	3 319	2 696	3 086	3 041	3 028	3 487	4 133	3 413	4 677	7 609
Netherlands	2 019	2 051	2 063	2 336	1 261	1 421	1 474	2 673	2 431	2 207	2 855	3 095	4 616
Japan	4 888	4 937	3 032	2 032	2 236	1 963	1 954	1 020	1 817	1 882	1 817	2 771	4 646
Rest of the world	26 707	28 056	36 410	38 000	29 104	27 955	24 115	26 537	23 903	27 882	29 545	34 298	47 156
<i>By region:</i>													
Europe	36 544	43 337	49 985	47 946	36 317	30 495	28 464	32 296	29 562	28 136	32 581	34 376	52 683
Asia and the Pacific	8 916	9 643	10 669	11 018	9 714	9 290	7 349	7 445	7 048	9 788	8 719	13 171	16 864
North America	12 071	11 513	15 282	12 565	11 342	12 644	12 933	13 998	12 663	12 982	14 948	14 715	21 378
Latin America and the Caribbean	4 447	5 163	7 177	8 394	6 581	5 798	5 724	6 198	6 778	6 618	7 365	8 791	12 242
Middle East and North Africa	872	1 129	2 045	2 242	3 103	2 103	2 324	2 238	2 333	2 924	2 493	4 003	4 104
Sub-Saharan Africa	1 489	1 104	1 892	2 367	1 570	1 991	1 780	1 318	1 129	2 111	1 360	1 854	2 473
Total	64 339	71 889	87 051	84 532	68 627	62 321	58 573	63 493	59 514	62 558	67 467	76 873	109 745

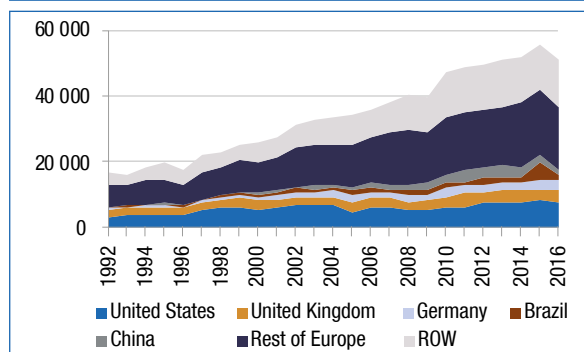
Table 12 (cont.) Processed gum arabic mirror import values (FOB), by country or region of destination, 1992–2016 (Thousands of dollars)

Country or region	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2014-2016 average
United States	21 839	24 249	22 619	20 518	21 374	22 675	23 372	25 929	29 156	26 988	29 115	28 148	28 084
Ireland	6 861	14 706	10 191	9 478	6 728	11 266	9 433	11 747	13 000	14 272	11 781	11 398	12 484
United Kingdom	13 206	12 120	8 811	8 124	10 073	9 925	11 654	14 027	12 485	12 093	11 913	11 522	11 843
Germany	13 868	12 249	8 422	9 122	6 967	8 415	9 169	9 457	9 169	9 478	10 020	10 218	9 905
China	4 239	4 981	6 606	7 260	9 560	8 571	12 146	13 696	11 819	13 077	10 546	5 572	9 732
Brazil	4 346	5 642	3 893	6 052	5 624	6 041	5 308	7 028	7 356	5 860	14 847	4 609	8 439
Switzerland	7 892	9 274	10 194	8 771	5 740	6 609	7 650	7 007	7 163	8 280	6 965	7 092	7 446
Italy	8 118	6 833	6 608	7 004	6 058	7 023	8 146	8 544	8 967	8 022	8 073	6 214	7 436
Netherlands	8 066	7 299	7 446	6 825	6 814	7 047	7 031	6 665	7 360	7 064	6 136	6 336	6 512
Japan	5 538	5 265	4 146	4 890	3 920	4 117	4 500	4 802	5 431	5 732	5 020	5 446	5 399
Rest of the world	68 325	60 186	66 154	72 997	69 689	77 478	82 432	86 335	83 171	86 577	82 393	85 583	84 851
<i>By region:</i>													
Europe	87 588	91 162	80 440	80 747	72 066	79 355	83 591	90 810	88 980	93 035	88 115	87 138	89 430
Asia and the Pacific	23 089	20 986	23 632	31 115	29 633	31 184	38 250	40 422	39 411	41 152	36 426	32 553	36 710
North America	22 906	25 150	23 518	21 647	23 250	24 450	25 572	27 857	31 320	28 884	31 077	30 671	30 211
Latin America and the Caribbean	17 894	16 914	16 380	17 908	17 563	19 725	19 148	22 749	21 793	20 841	29 545	17 902	22 763
Middle East and North Africa	5 903	5 423	7 485	7 445	7 492	10 588	10 906	9 103	9 150	9 498	7 923	8 538	8 653
Sub-Saharan Africa	4 811	3 081	3 455	2 018	2 403	3 867	3 375	4 152	4 250	3 920	3 517	5 134	4 190
Total	162 192	162 716	154 910	160 879	152 407	169 170	180 842	195 093	194 905	197 331	196 604	181 937	191 957

Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources (mirror data).

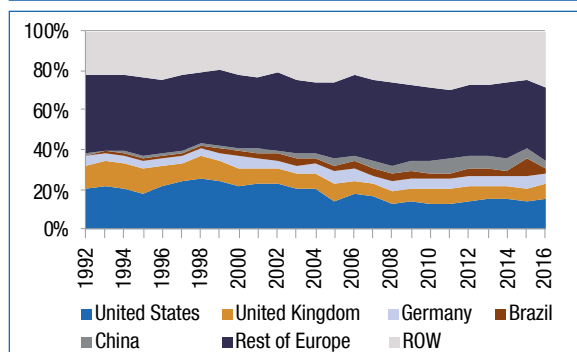
Note: Countries are ranked according to descending 2014–2016 averages.

**Figure 26** Processed gum arabic import quantities, by main importers, 1992–2016 (Tons)



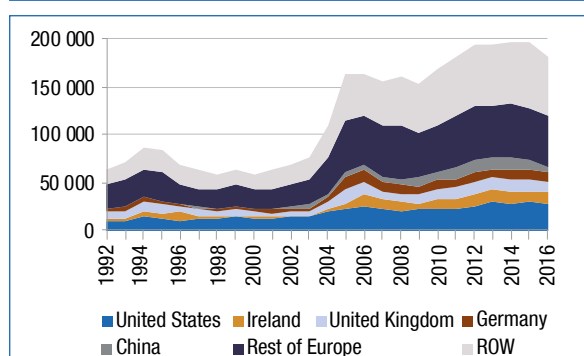
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 27** Processed gum arabic import quantity market shares, by main importers, 1992–2016 (Percentage)



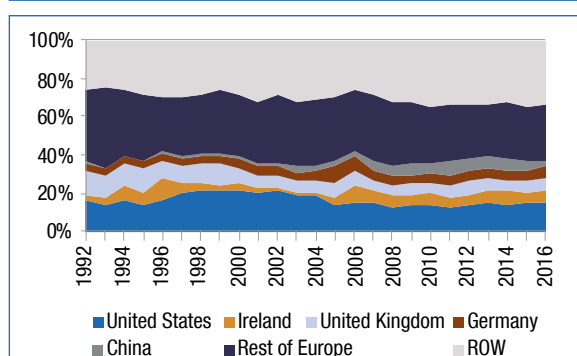
Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 28** Processed gum arabic import values, by main importers, 1992–2016 (Thousands of dollars)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

**Figure 29** Processed gum arabic import value market shares, by main importers, 1992–2016 (Percentage)



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Imports of processed gum arabic are substantially less concentrated than exports. While France alone accounted for 69 per cent of total exports in 2014–2016, the largest importer, the United States, was responsible for 15 per cent of total imports. The same discrepancy is observed in terms of the five largest exporters (combined market share of 92 per cent) and the five largest importers (37 per cent market share). Processed gum arabic imports are also considerably less concentrated than crude gum arabic exports or imports, which are dominated by African and European countries, respectively. The more balanced distribution of processed gum imports reflects the wide applications of gum arabic in industries that are diversified at a global level.

Although imports by the United States more than doubled in both quantity and value terms in the last quarter century, they increased at a slower rate than imports elsewhere. As a result, the market share

of the leading player decreased after 2000. This is in marked contrast with the trend of increasing concentration for both crude gum imports and processed gum exports, where the market shares of France grew significantly over time (the same is true for the share of India in crude gum arabic imports).

Processed gum arabic imports by developing countries have increased significantly in recent decades. Their combined import value market share increased from 17 per cent in 1992–1994 to 35 per cent in 2014–2016. Chinese imports surged from \$195,000 in 1992–1994 to nearly \$10 million in 2014–2016. In Brazil, imports increased from \$1 million to \$8.5 million in the same period. Five other emerging economies imported between \$3 million and \$5 million per year in 2014–2016: Mexico, Argentina, the Russian Federation, the Republic of Korea and Turkey (in descending order).

Despite the increase in the import market shares of emerging and developing countries, Europe remained the largest importer of processed gum arabic throughout the 1992–2016 period. Nevertheless, the combined market share for all European countries declined from 58 per cent in 1992–1994 to 47 per cent in 2014–2016. Ireland and the United Kingdom were the leading European importers, each importing

\$12–\$12.5 million per year in 2014–2016. They were followed by Germany (\$10 million) and Switzerland (\$7.5 million). The average annual imports of processed gum arabic in 2014–2016 of France (\$5 million) were outshined by its average annual exports (\$125 million) and the domestic sales by French gum arabic manufacturers (\$14 million–\$22 million) in the same period.





# CHAPTER V

## PRICES

Gum arabic prices vary on the basis of several factors, including botanical source, geographical origin, grade and level of processing. Historically, prices for *Acacia senegal* gum are substantially higher than prices for *Acacia seyal* gum. However, relative prices between the two gums fluctuate according to prevailing supply and demand forces. Gum arabic prices also vary significantly from country to country, and even from region to region within a given country. For example, in the Sudan, the Kordofan region is well known for producing the highest quality gum arabic. In Senegal, the same is true of the Ferlo region. As a result, gums from these regions command higher prices than gums produced elsewhere within the respective countries. Moreover, crude gum arabic prices vary by grade. For instance, in the Sudan, HPS commands the highest prices, followed by CAS, cleaned gum, siftings and dust.

Given its exceptional reputation, Kordofan Hashab has long been the standard against which all other gums are judged. Thus, it provides the main reference price in the international market. Other reference prices for hard gum are Grade 1 (Nigeria) and Kitir (Chad). Talha (the Sudan), Grade 2 (Nigeria) and Talha (Chad) are the main reference prices for friable gum. While prices in the Sudan and Chad are expressed in an FOB basis (at Port Sudan and Douala, respectively), Nigerian prices are expressed on a CIF basis at northwestern European ports. Unlike many agricultural and mineral commodities, gum arabic is not traded through futures contracts on exchanges that standardize the quantity and minimum quality of the products traded. Figures 30 and 31 illustrate gum arabic export prices in the Sudan and Nigeria during different time periods (2006–2016 for the former; 1997–2009 for the latter).

**Figure 30 Kordofan hashab, FOB Port Sudan, 2006–2016 (Dollars per ton)**



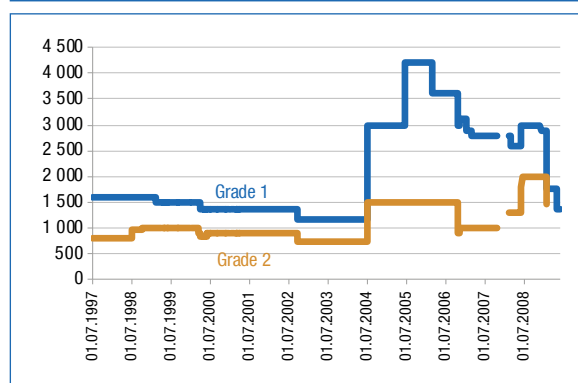
Source: UNCTAD secretariat calculations, based on data from the Public Ledger.

The Kordofan FOB price peaked at \$4,200 per ton in mid-2006, fell to \$3,200 in late 2006 and reached a low of \$1,800 per ton in early 2010. A renewed peak of \$4,200 per ton in 2011 coincided with the peak of the latest commodities price boom, as measured by the UNCTAD price indices for food and agricultural raw materials. Subsequently, the Kordofan FOB price fluctuated between \$2,800 and \$3,400 per ton in 2012–2015 and followed a largely downward trend in 2016.

Nigerian Grade 1 and Grade 2 prices are highly correlated, as indicated by a coefficient of correlation of 0.80 between 1997 and 2006. Nonetheless, the price ratio of the two grades varied significantly over time, from as high as 3.33 in November and December of 2006, during a major hard gum supply shortfall in the Sudan, to as low as 1.21 in January 2009, after demand for friable gum received a boost from the decision by the European Union to grant official food ingredient status to gum arabic.

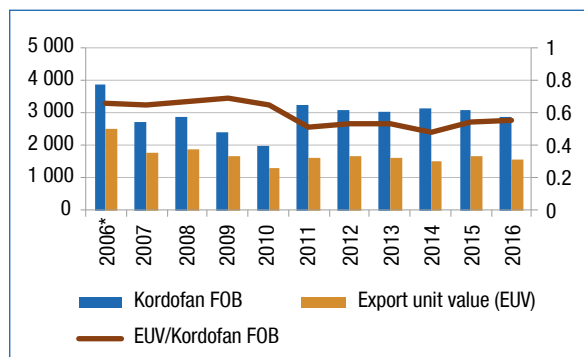
As opposed to reference prices, which refer to a specific type of gum, national export unit values (EUV) reflect the actual composition of a country's exports, which may include gums of different botanical sources, grades and processing levels. For example, while the annual average Kordofan FOB price was \$2,852 per ton in 2016, the Sudanese EUV for crude gum arabic was \$1,570 per ton. On average, the Sudanese EUV corresponded to 66 per cent of the Kordofan FOB price in 2006–2010 and 52 per cent in 2011–2016 (figure 32). This is because not all gum exported by the Sudan was hard gum of Kordofan origin. An important and increasing share of Sudanese gum arabic exports is composed of friable gum, which commands a lower price. For example, in December 2016, the FOB price

**Figure 31 Nigeria Grades 1 and 2, CIF NW Europe, 1997–2009 (Euros per ton)**



Source: UNCTAD secretariat calculations, based on data from the Public Ledger.

**Figure 32 Reference price and export unit value, Sudan, 2006–2016 (Dollars per ton)**



Source: UNCTAD secretariat calculations, based on data from the Public Ledger, UN Comtrade and official sources.  
Note: Kordofan FOB data for 2006 cover only the second semester.

for Sudanese friable gum was \$700 per ton, just over a quarter of the Kordofan FOB price of \$2,650 per ton.

In Nigeria, EUVs corresponded on average to 35 per cent of the Grade 1 reference price in 1998–2006 (figure 33). The Nigerian EUV was also consistently below the Grade 2 reference price, which suggests that a large share of Nigerian exports were composed of shiftings and low quality gums (Grade 3).

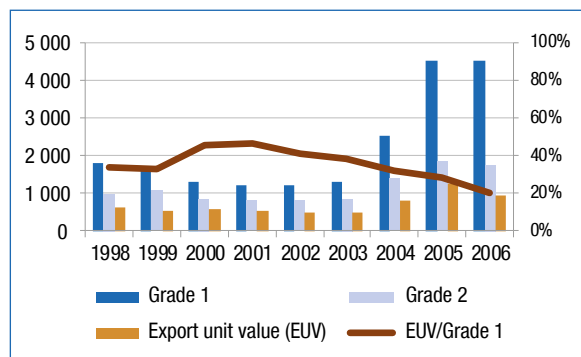
Nigerian EUVs were consistently lower than Sudanese EUVs in 1992–2016 (see figure 34), due to the large share of friable gum in total Nigerian gum exports and the inferior reputation of Nigerian gums in terms of quality and consistency.<sup>40</sup> On the other hand, EUVs of Chad are closer to those of the Sudan, especially after 2009. While Mauritanian and Senegalese EUVs tend to follow Sudanese and Chadian EUVs, Cameroonian and Malian EUVs are closer to those of Nigeria.

Export prices are transmitted through value chains by consecutive agents. First, exporters fix prices in domestic terminal markets by deducting commercialization expenses (such as transportation, storage, cleaning, sorting and packaging) from the FOB price. Subsequently, other agents in the value chain apply the same cascading rule, thus fixing prices based on incurred costs. At the opposite end of the chain, local merchants fix the price received by producers.

As observed in the Cameroonian and Sudanese value chains examined in chapter III, the price received by

<sup>40</sup> Gum shipments from Nigeria are more likely to consist of a mix of gums from different botanical sources, such as *Acacia senegal*, *Acacia seyal* or even the *Combretum* genus. Such mixes tend to produce dark-coloured solutions with insoluble particles, which are unsuitable for a number of industrial applications.

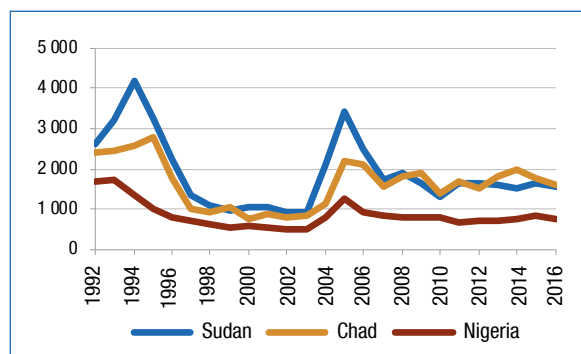
**Figure 33 Reference prices and export unit value, Nigeria, 1998–2006 (Dollars per ton)**



Source: UNCTAD secretariat calculations, based on data from the Public Ledger, UN Comtrade and official sources.  
Note: Reference prices were converted from euros per ton into United States dollars per ton.

producers in the formal market can differ significantly from the export price. This discrepancy encourages producers and local merchants to participate in more remunerative informal markets. In the absence of time series data for producer prices, it is not possible to examine the extent to which gum arabic producers are integrated into the international markets. However, anecdotal information from the Sudan indicates that since the liberalization of the sector, in 2009, the correlation between producer prices and international prices has become stronger. As a result, shocks to international prices are generally transmitted to the domestic price. While this implies higher profits for producers during price booms, it also increases risk, as GAC is no longer required to purchase gum at guaranteed minimum prices. As smallholders have little access to risk management tools to hedge against price swings, they are especially vulnerable to price volatility (UNCTAD, 2015).

**Figure 34 Export unit values, Sudan, Chad and Nigeria, 1992–2016 (Dollars per ton)**



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.





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# CHAPTER VI

## CONCLUSION

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Gum arabic is an auspicious commodity for a number of sub-Saharan African countries due to its potential to generate foreign exchange reserves, promote sustainable agriculture and forestry, ensure food security and combat desertification and climate change. Moreover, given its superior properties, natural origin and safety record, gum arabic finds commercially valuable applications in many industries. In this context, gum arabic could play a critical role in efforts to achieve the Sustainable Development Goals set forth in the 2030 Agenda for Sustainable Development.

Despite the significant expansion in production in the last decade, the gum arabic sectors in producing countries continue to be characterized by low domestic value addition, export orientation, gender segmentation and an inequitable sharing of benefits among stakeholders. Producers are hampered by a number of challenges, including low production and marketing skills, insufficient market information, inadequate infrastructure and financial services, high insecurity and limited direct access to international markets.

There are important discrepancies across producing countries, with the Sudan playing a leadership role both in terms of the quantities produced and quality. While Chad has made significant progress in recent decades, Nigeria has been hindered by quality inconsistency, poor market organization and production disruptions due to the Boko Haram insurgency. In Cameroon, Mali and Senegal, exports have started to rebound after decades of decline and stagnation. In most other countries in the African gum belt, production remains low and irregular. Although these countries are endowed with favourable natural conditions, domestic gum resources remain underexploited. For example, in parts of Ethiopia, Kenya and South Sudan, local communities lack awareness of the commercial value of gum arabic.

On a global scale, the sector is marked by a high level of concentration, with two countries accounting for three-quarters of all crude gum arabic imports and one country accounting for two thirds of all processed gum arabic exports. More notably, a single European

manufacturer – Nexira – is believed to hold a 50 per cent global market share. As a result, the gum arabic global value chain is characterized by important asymmetries. In some African countries, producers are estimated to capture only 4.5–5 per cent of the unit value of processed gum exported by European and Asian manufacturers.

To ensure that all stakeholders capture a fair share of the total value generated along the gum arabic global value chain, a combination of micro, meso and macro reforms are required. At the micro level, policies designed to support gum producers should promote: (i) improved production skills and equipment adoption, through targeted training on optimal tapping and harvesting techniques; (ii) increased product differentiation and value addition, through investment in post-harvest activities such as cleaning, sorting, grading and marketing; (iii) stronger market power, through the formation of commercially-oriented producers' associations and cooperatives; (iv) increased profitability, through the provision of finance and risk-management instruments, which would allow producers to procure sufficient inputs without having to enter into interlocked contracts and to sell output at more favourable prices; and (v) gender equality, through initiatives that combat gender segmentation and provide women with equal opportunities.

At the meso level, fostering local processing and consumption would increase domestic competition and value addition, with expected benefits to producers. In addition, improved access to information on price trends, quality requirements and market access would result in better integration into markets and the potential elimination of intermediaries. Finally, at the macro level, greater security, better institutions and overall macroeconomic stability would also benefit stakeholders throughout the gum arabic sector. Ultimately, the transformation of gum arabic production into a more remunerative activity has the potential to not only promote economic development through higher incomes, but also secure rural livelihoods, empower vulnerable groups and promote synergies with natural resource management and climate change mitigation.

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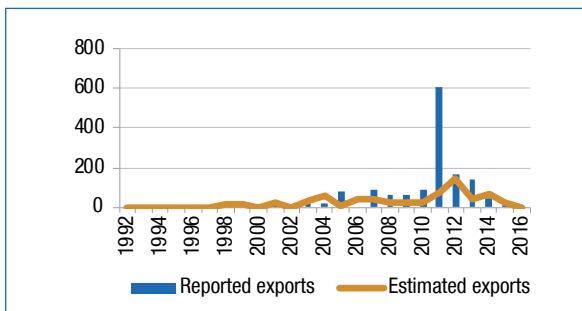
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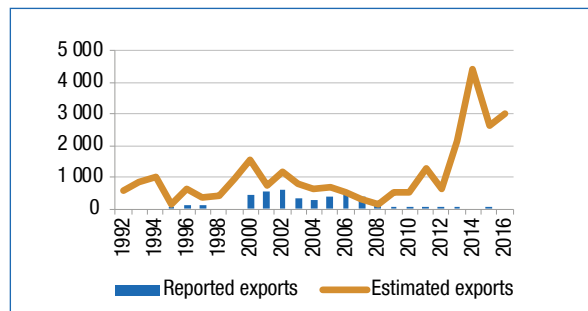
# ANNEX

## REPORTED AND ESTIMATED EXPORTS OF CRUDE GUM ARABIC, BY EXPORTING COUNTRY, 1992–2016 (TONS)

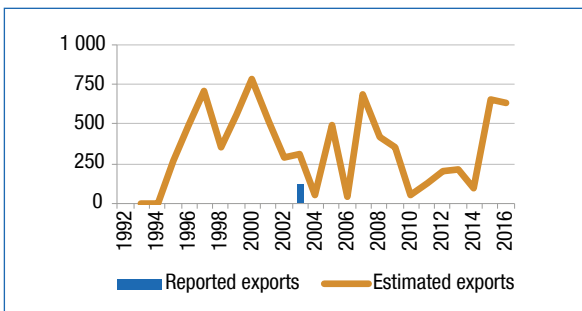
**Figure A1 Burkina Faso**



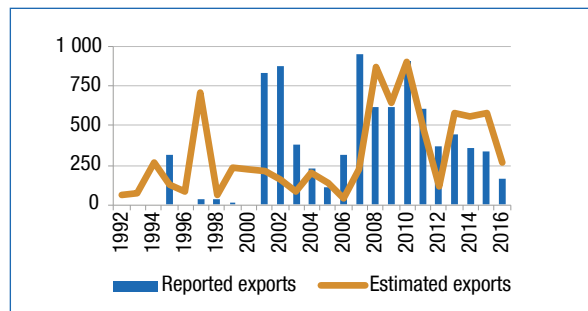
**Figure A2 Cameroon**



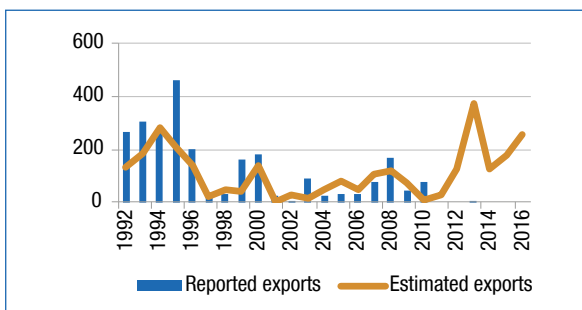
**Figure A3 Eritrea**



**Figure A4 Ethiopia**



**Figure A5 Kenya**



**Figure A6 Mali**

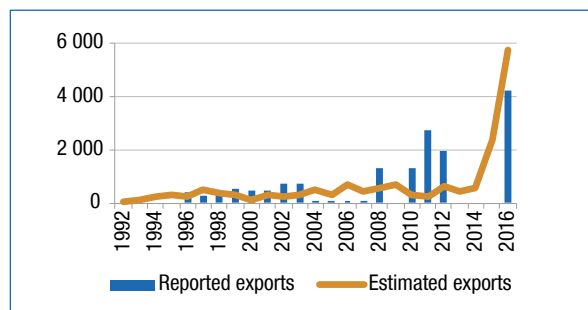




Figure A7 Mauritania

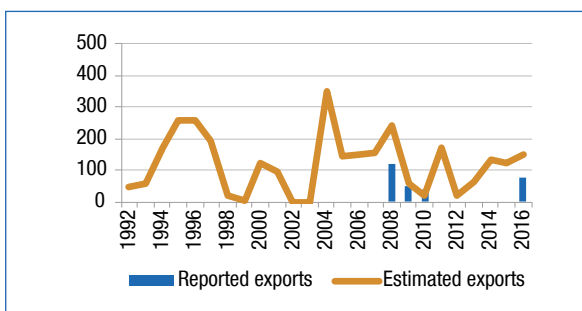


Figure A8 Niger

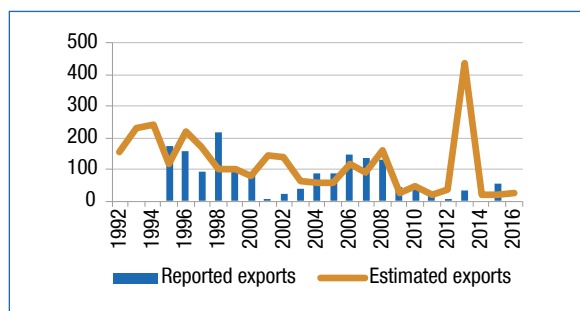


Figure A9 Nigeria

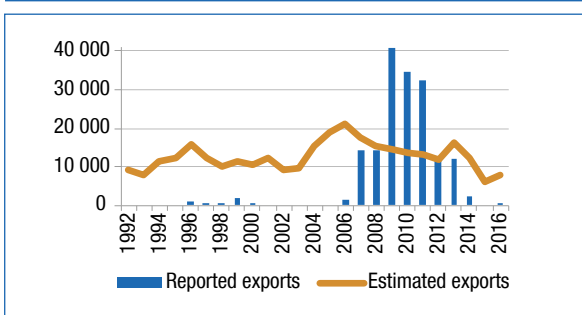


Figure A10 Senegal

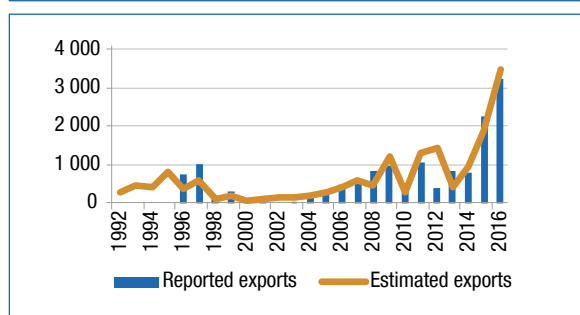


Figure A11 Sudan

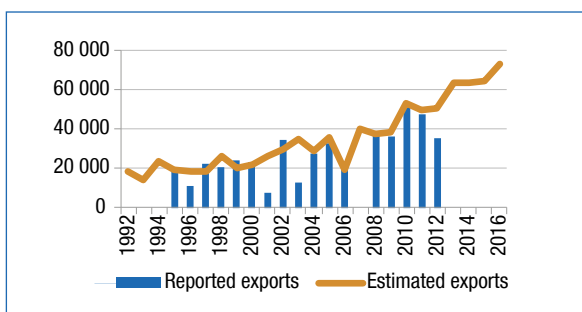


Figure A12 Uganda

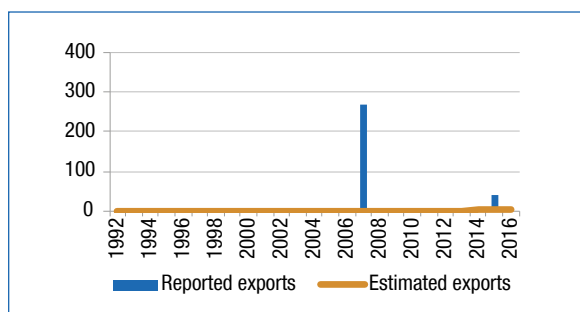
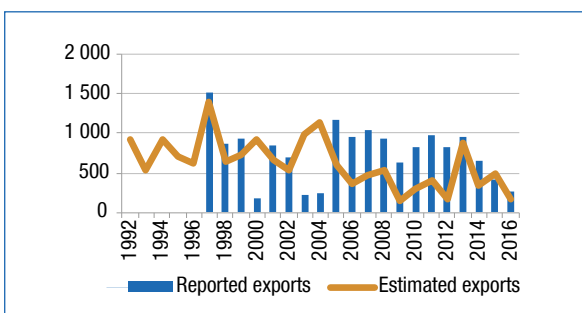


Figure A13 United Republic of Tanzania



Source: UNCTAD secretariat calculations, based on data from UN Comtrade and official sources.

Note: Chad, Somalia and South Sudan did not report exports between 1992 and 2016.

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