

**COMMERCIAL GUM AND GUM-RESIN RESOURCES IN KENYA:
THEIR DESCRIPTION, HARVESTING, VALUE ADDITION, TRADE AND
MARKETING**

By

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Abstract

Gums and resins are among the natural resources in Kenya with potential for generating wealth and uplifting the living standards of the local communities in the drylands. The quality of Kenyan gums and resins is however affected by various factors that include botanical origin and mixing of different species. Effort is therefore required to address issues related to improvement and production of commodities from these resources including correct species identification. Commercial gum arabic is obtained from *Acacia senegal* or *A. seyal* while gum resins are myrrh from *Commiphora myrrha*, hagar from *C. holtziana* and frankincense from *Boswellia neglecta*. Species that are likely to be confused with *A. senegal* are *A. condyloclada*, *A. hamulosa*, *A. ogadensis*, and *A. thomasii* while those likely to be confused with *A. seyal* are *A. zanzibarica*, *A. xanthophloea* and *A. hockii*. Possible adulterants of gum arabic are *A. paolii* and *A. mellifera* while resins are usually adulterated with *C. africana*, *Commiphora confusa*, *C. habessinica*, *C. schimperi*, *C. pseudopaolii*, *C. kua* var. *gowlollo* and *C. incisa*. Harvesting of gums and resins is done manually by labor-intensive traditional methods of tapping. All gums and resins produced in Kenya are exported in raw form except for a small quantity of the total volume produced that is processed for essential oils. The resource potential of gums (3000 MT) and resins (3500 MT) far exceeds current levels of production (.400-500 MT for gum arabic and 1000 MT for gum resins). Both cultural and conventional markets exist for these products. However, exports of gum arabic from Kenya are still very small relative to the resource potential. A numbers of factors that affect the supply and marketing of these commodities have been highlighted. It is concluded that there is room for increased collection and marketing of gums and gum resins through intervention of the identified constraints and diversification of the sub-sector. A structured approach to sub-sector development through public private partnership is recommended.

Keywords: Gums and gum resins, harvesting, value addition, trade, marketing,

1. Introduction

Kenya has resources of gums and resins with commercial production confined to the dry lands of the country. Gum arabic comes from *Acacia senegal* (L.) Willd. or *Acacia seyal* Del. while commercial gum resins are myrrh from *Commiphora myrrha*, Hagar from *Commiphora holtziana* and Frankincense from *Boswellia neglecta* S. Moore. These are trees and shrubs that are dominant and form an important component of the vegetation in the dry lands of Kenya often referred to as *Acacia-Commiphora* woodland.

These resources have potential for generating wealth and uplifting the living standards of the local communities in the dry lands. They fall into the category of Non-Wood Forest Products (NWFPs); renewable resources that could be sustainably exploited for household income and still conserve biological diversity and ecosystem functions while increasing overall productivity of the land. They can serve as raw materials for enterprise development thus providing opportunities for trade and employment generation thereby uplifting the socio-economic status of the local communities. This is especially important to Kenya's drylands which have few options for alternative sources of livelihood due to the difficult environmental conditions, resulting from scant and erratic rainfall and poor soils. These resources are very unique and important to the local communities as they produce gums and gum resins in the dry season when forage is scarce, thereby allowing the communities to be occupied in a meaningful economic activity during the hard times. Gum Arabic is also chewed by the locals and therefore provides a source of food during the harsh times. The potential prospects for these resources are therefore very high if they can be properly developed. This paper reviews the gums and resins resources in Kenya, their distribution, description, uses, value addition, trade and marketing.

2. Gums and resins resources

Through the support of the Technical Cooperation Programme of FAO, resource assessment and mapping of gums and resins in Kenya was conducted in 2005 by the Regional Centre for Mapping of Resources for Development. A probability map was produced for gums and resins resources in Kenya and is shown (Figure 1). The taxonomy, ecology and distribution of the key gum and resins producing species are described below.

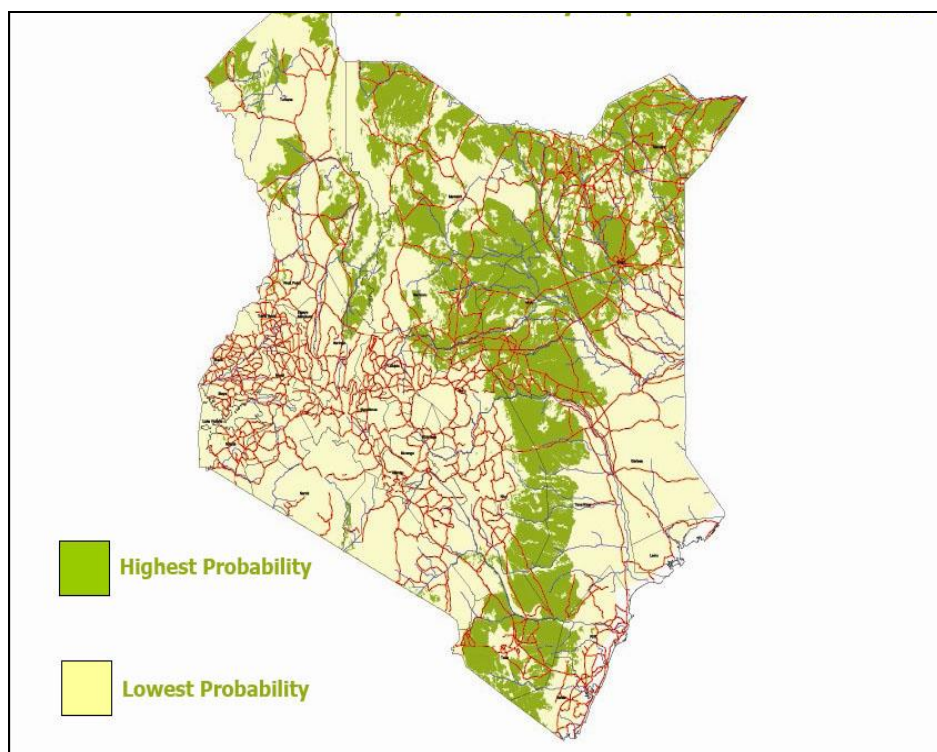


Figure 1: A probability map for gums and resins resources in Kenya (Source: FAO, 2005)

2.1 Gum Arabic Resources

Description and uses

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) defines gum arabic as the 'dried exudation obtained from the stems and branches of *Acacia senegal* or *A. seyal* (FAO, 1998). In its natural state, it comes in a variety of shapes, colours and sizes. The colour of the gum may vary from colourless through different shades of yellow, amber, orange, red and dark brown. The best grades from *A. senegal* are in the form of whole, round tears, orange-brown in colour and with a matt surface texture. Gum from *A. seyal* is more friable than that produced by *A. senegal* and is rarely found as whole lumps. Use of gum arabic falls into three main sub-sectors: food industry, pharmaceutical industry and technical areas such as printing, ceramics and textile industries (Chikamai and Odera, 2002).

Gum Arabic producing species

The key gum arabic producing species *Acacia senegal* and *Acacia seyal* are both present in Kenya. Both species have been characterized in terms of their taxonomy and ecology (Gachathi, 1994 and Chikamai, 2001). The potential adulterants have also been characterized. *Acacia senegal* has three varieties namely: *Acacia senegal* var. *kerensis*, *Acacia senegal* var. *senegal* and *Acacia senegal* var. *leiorhachis* (Figure 2). *Acacia senegal* var. *kerensis*, is the main source of commercial gum arabic in Kenya. *Variety senegal* occurs in areas of relatively

higher rainfall, produces gum on tapping in some areas but not been developed commercially. Variety *leiorhachis* is more restricted but its potential for gum production has not been established.

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(a) var. *senegal* (b) var. *kerensis* (c) var. *leiorhachis* (c) var. *leiorhachis*

Figure 2: Varieties of *Acacia Senegal*

var. *seyal*

var. *fistula*

Figure 3. Varieties of *Acacia seyal*

Acacia seyal has two varieties: var. *seyal* (Schweinf.) Oliv. and var. *fistula* Oliv (Figure 3). Var. *seyal* is characterized by reddish or reddish brown and occasionally green back. Spines are sharply pointed, more or less straight, in pairs and normal. Var. *fistula* has pairs of spines fused at the base forming pseudo-galls often called ant-galls because they are often associated with ants. Bark is typically white or greenish yellow. The local names associated with *A. senegal* include: Ekunoit (Turkana), Eداد, Adad (Somali), Idado (Borana), Ol-derekesi (Maasai),

Lolderikesi (Samburu), Chemangayan (Pokot), Bura-dima (Orma), Mirgi (Rendile), Mung'ole (Kamba).

2.2 Gum resin resources

Myrrh and frankincense are the main gum resins from Kenya's drylands. These products are mainly processed for the extraction of essential oils..

Myrrh

Myrrh is the gum-resin exudate from the stems of *Commiphora myrrha* (Figure 4). It oozes and hardens to form lumps of varying shapes and sizes of variable colour from red, brown to dark brown. Locally, it is used to make ink used in Quranic schools, burning to repel snakes and offensive insects and medicine for various ailments. Its commercial uses are mainly essential oils, cosmetics, flavours, antiseptics and other medicines.

Gum resin

Commiphora myrrha Tree

Leaves

Figure 4: *Commiphora myrrha* tree and resin

Hagar (opoponax)

Hagar is oily resin exudate from the stems of *Commiphora holtiziana* (Figure 5). It oozes out and hardens to form lumps of various sizes and shapes with variable colour from yellow to dark brown or black. Locally, hagar is used as acaricide against ticks, snake bites, scorpions, foot rot, mange and other livestock ailments. Commercially, it is a well- established herbal medicine and essential oil in cosmetics.

Tree

Stem/Bark

Leaves

Figure 5: *Commiphora holtziana* tree

Frankincense

Frankincense is the exudate from the stems of *Boswellia neglecta* (Figure 6). It oozes out in small droplets that harden to form nodules or large lumps. It is of two types, black and white. Locally it is used as chewing gum, burnt as incense, perfume and medicine for a wide range of ailments. Commercially it is used as essential oil in perfumery, cosmetic as well as flavour industries.

Tree

Fruiting Branch

Frankincense

Figure 6: *Boswellia neglecta* tree

3. Possible adulterants of commercial gums and gum resins

There are a number of other indigenous trees that are also known to produce gums and gum-resin products that are similar but inferior and therefore of less commercial value and whose gums possible adulterants are particularly for gum arabic and myrrh (Gachathi and Muga, 2009). These species include: *Acacia paolii* Chiov. and *A. mellifera* (Vahl) Benth. in the family Mimosaceae for gum arabic and *Commiphora africana* (A. Rich.) Engl., *C. confusa* Vollesen, *C. habessinica* (O. Berg) Engl., *C. schimperi* (O. Berg) Engl., *C. pseudopaolii* Gillett, *C. kua* (J.F. Royle) Vollesen var. *gowllelo* (Sprague) J.B. Gillett, and *C. incisa* Chiov. in the family Burseraceae for commercial gum resins.

4. Harvesting of gums and resins

Harvesting is done manually by labor-intensive traditional methods of tapping. Tapping is carried out shortly after the rains when the trees begin to shade the leaves. Tapping and collection of gum is carried out following a specific pattern around mid-September up to the end of the dry season, usually June. Tapping involves the shaving of a very thin, i.e. 2mm deep and 4-8mm wide, external layer of the bark starting at 0.5m from the base of the stem using a hand tool, 'Mingaf' for resins and 'Sonke' for Gum arabic. Once the 1st tapping is done, the 2nd tapping will take place after 30-40 days and involves a moderate widening of the wound, which was started during the 1st tapping. This tapping process will continue for three to four months until the wound has reached 4cm width. After each wounding/incision, the exudates start to ooze and becomes dry in 2-3 weeks when it will be ready for collection. (*Chikamai. and Kagombe, ., 2002*). Collection of gums and resins from the wild is mainly done by women and herders during the dry months of the year.

5. Value addition for gums and resins

Post harvest handling of gum involves, storage, cleaning, sorting, grading, packaging and labeling. All gums and resins produced in Kenya are exported in raw form except for a small quantity of the total volume produced that is processed for essential oils. There is only one processor of gum resins in Kenya. The name of this processor is Vetochem Limited. Vetochem limited extracts essential oils from myrrh, Olibanum (Frankincense) and Opoponax (Hagar) through steam distillation process with an efficiency level of 70%. The yield of essential oils at 70% efficiency level is 5% for myrrh and 6% for Olibanum and Hagar. Thus, the product derived from gum resins is mainly the essential oils. In Kenya, there is no company that processes gum arabic. However, Arid Land Resources Limited (ALRL) carries out value addition to gum arabic by grinding the product and grading it before exporting. Other exporters of gum arabic add value to the product by removing impurities such as the tree bark and then sorting and grading the gum into different grades before selling it to the export market. To enhance the quality of gum, gum arabic should not be stored in plastic bags but in clean sisal or polyethylene gunny bags as plastic bags forms moisture results in the contamination of the gums. The gum should also be stored in a dry, clean and cool place, right from the village level. The gum should be stored in a raised ground. Resins need to be stored separately in a different store to avoid mixing with gum Arabic. Construction of stores for gums and resins in a number of districts has been supported by ENNDA, Centre for Training in Integrated Research in ASAL Development (CETRAD) and African Wild Life Foundation. More than 300 people have been trained on production and post harvest handling of gums and resins by KEFRI through the support of various organizations such as ADB, FAO etc. Packaging is done according to the importers requirements. Powdered gum arabic is packed in 50 kgs net weight bags while first grade lumps are packed in 25kgs net wt bags.

6. Marketing of gum arabic and gum resins

The current annual world demand for gum Arabic is about 100,000 MT against a current supply of about 70,000 MT which is projected to reach 150,000 MT by 2020 (Muller and Okoro, 2005). The annual world demand for gum resins is estimated at around 2500 MT. The resource potential of gums and resins far exceeds current levels of production. For example, potential for gum arabic production is 3,000 MT against an average production of 400-500 MT while for resins (myrrh, hagar, frankincense) the potential is 3500 MT against an average production of around 1000 MT. Both cultural and conventional markets exist for these products. However, exports of gum arabic from Kenya are still very small relative to the resource potential. Annual exports have been only a few 100 tonnes which reached a peak of 460 MT in 1995 (Chikamai *et al*, 2010). Kenya is a major exporter of resins (myrrh, hagar and frankincense) being number three after Ethiopia and Somalia. Export volumes reached a peak of 1130 MT worth about US\$ 2.6 million in 2000 (Chikamai and Casadei, 2005). Profit margins for local traders and producers are quite low making them to rely on selling groceries, and hides and skins to break-even. This explains why investment by such local dealers in marketing infrastructure is low.

Factors affecting supply and market information system

Major constraints limiting increased collection and marketing of gums and gum resins include: Lack of clear policy on the development of gums and resins, poorly developed markets and marketing systems, poor prices, harsh and difficult terrain, frequent droughts, insecurity, animal and human damage to trees, lack of access to adequate capital, famine and poverty, disease and poor health facilities, poor production practices, land tenure issues, lack of adequate data on the resources and socio-cultural perceptions. There is room for increased collection and marketing of gums and gum resins through intervention of the above constraints and diversification of the sub-sector.

7. Conclusions and recommendations

Gums and resins hold a lot of potential towards the support of livelihood among the local communities in the dry lands of Kenya. The trade in these commodities is constrained by a number of social, political and economic factors. There is therefore need for concerted effort towards strengthening the producer associations, construction of storage facilities in strategic locations, capacity building, provision information on prices and markets and development of marketing systems. There is room for increased collection and marketing of gums and gum resins through intervention of the identified constraints and diversification of the sub-sector. It is also crucial that a structured approach to sub-sector development through public private partnership be promoted.

8. References

Chikamai, B. M. Muga and M. Marangu. 2010. Development of the gum arabic sub-sector in Kenya. A paper presented during the conference on "New Developments in Acacia Gums Research, Products and Processes" held at Glyndwr University, UK, September 20-22, 2010

Chikamai, B.N., E. Casadei (eds). 2005. Production and Marketing of Gum resins: Frankincense, Myrrh and Opoponax. NGARA series 5. 97 pp

Chikamai B.N. and Odera J.A. eds. 2002. Commercial Plant Gums and Gum Resins in Kenya: Sources of Alternative Livelihood and Economic Development in the Drylands. Executive Printers, Nairobi, Kenya.

Chikamai, B.N. and J. Kagombe (2002): Country report for Kenya. In Chikamai, B.N. (Ed.): *Review and synthesis on the state of knowledge of Boswellia species and commercialisation of frankincense in the dryland of Eastern Africa*. FAO, EU and FORNESSA. Pp 36 -51

Chikamai, B.N., Gachathi, N., 1994: Gum and resin resources in Isiolo District, Kenya: Ethnobotanical and Reconnaissance survey; E. Afr agric, For. J (1994) 59(4), 345-351

Chikamai, B.N., Hall, J.B., 1995: Survey of *Acacia senegal* resources for gum Arabic in Northern Kenya. Commonwealth Forestry Review 74 (3), 1995

Chikama, B.N., 2001: Taxonomic and ecological characteristics of the Acacia Gum tree; Paper presented at the Symposium on "Acacia Gum: Food ingredient for the future.", Nefta, Tunisia: 21st to 23rd February 2001

FAO. 2005: Mapping gums and resins in Eastern Africa. TCP/2914 Project Report.

Gachathi, F.N.M. 1994: Variation in *Acacia senegal* and its Relationship with *Acacia circummaginata* and *Acacia thomasii* in Kenya. Msc. Thesis in Pure and Applied Fungal Taxonomy, University of Reading, Reading.

Gachathi, F.N.M., and Muga, M.O., 2009: A review of commercial gums and resins resources in Kenya. Proceedings of the 4th KEFRI scientific conference. KEFRI Headquarters, Muguga, Kenya, 6-9 October, 2008.

Muller and Okoro. 2004. Production and marketing of Gum acacia. NGARA Publication Series 2.

Additional reading materials

Dharani, N. 2006. Field Guide to Acacias of East Africa. Struik Publishers (Adivision of New Holland Publishing (South Africa) (Pty) Ltd). Cape Town.

FAO, 1998. Food and Nutrition Paper No. 52, FAO, Rome.

ITC. 1983. The Gum acacia market and the development of production. International Trade Centre, UNCTAD/GATT, Geneva and the United Nations Sudano-Sahelaian Office.

ITC, 2008. Gum acacia news service (Mns). Quarterly edition. International Trade Centre UNCTAD/WTO(ITC).