Uses of tree species producing gum arabic in Karamoja, Uganda

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Abstract

This article presents an inventory of the uses of the tree species producing gum arabic by the local community in the Karamoja region. The study was conduced in 2000 using semi-structured interviews, focal group discussions and participants' observation.There were three tree genera with a total of six species that produced gum arabic. These were *Balanites aegyptica*, *Acacia senegal*, *A. seyal*, *A. sieberiana*, *A. gerrardii* and *Lanea humilis*. The dominant species producing gum arabic were *A. senegal* (85%), *A. seyal* (87%) and *A. sieberiana* (70.5%).Other uses by the local people included fencing, fuel wood, poles, crafts, medicine, intercropping, fibre and extraction of tannin. The intensity of utilization for fencing, fuel wood and poles was higher than that of gum arabic production. The local uses of gum arabic were food, gumming spears, gumming pots, gluing arrows, gluing broken stools, calabashes and joining leather.Establishing and facilitating the conservation status of these tree species are important for maintaining and even increasing the provisions for the local uses by the local community in Karamoja.

Key words: Acacia, gum arabic, Karamoja, local people

Introduction

Although Karamoja has limited sources of income for its people, it has natural resources that contribute to its development. Such resources include livestock and their products, minerals, gum arabic and other forest resources. At the moment, the local people are heavily dependent on livestock, sorghum production and small-scale trade. Gum arabic is another potential resource for exploitation. It is a sap-like substance that exudes from fissures and wounds of *Acacia* trees and hardens after a few weeks into shiny amber-coloured globules (Friedmann & Rangan, 1993). Gum arabic was used as far back as 4000 BC when it was shipped to Europe from Arabian ports. Its colour varies from dark brown to white depending on the content of tannins (Coppen, 1984). Gum arabic consists mainly of high molecular weight polysaccharides, calcium, magnesium and potassium that yield arabinose, galactose, rahamnose and gluconic acid. Other uses of *Acacia* are the provision of fodder to domestic and wild animals, shade for grasses, wildlife, domestic stock and humans.

Gum arabic can be used as additives in the manufacture of certain foods, as emulsifier and stabilizer in the pharmaceutical and cosmetics industry. It is also used in the film industry and for glaze binders in ceramics and atomic reactors. Based on these uses, gum arabic has long been sold on the world markets. *Acacia senegal* is the most important forest crop in Sudan. Export of the gum in 1966 was between 40,000 and 50,000 t year^{-1} and was valued at about US$ 15–20 million. In addition to the yields of the gum from natural forests of *A. senegal*, this species was extensively raised in plantations on a large scale (gum gardens) for the production of gum arabic.

The local people obtained large amounts of income from the gum and it was an incentive for them to plant the trees. The impact of gum production on the income of farmers in Sudan has significantly increased the interest of farmers and their awareness of the benefits of planting *A. senegal*. Nationally, gum arabic has played a substantial role in the economy through foreign exchange earnings. The market is likely to be sustained as no synthetic substitutes have better physical and chemical characteristics of the gum. The prices have also risen slightly depending on the quality, from US$ 700 to US $ 1250 per kg.

For commercial purposes, only two of the *Acacia* species are significant: *A. senegal* which produces the best type of gum and provides the bulk for world trade and *Acacia seyal* which produces a lower grade of gum (Adamson & Bell,

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1974). Gum from *A. senegal* is considered to be the best in quality because it possesses low quantities of tannins (Coppen, 1984). Any future plans for gum production and marketing should therefore focus on this species.

The gum is used to manufacture office glue, medicine, in textile and food industries and in preparing paints and printing ink (Adamson & Bell, 1974; FAO, 1976; Von Maydell, 1986). Gum arabic production and marketing was a viable economic activity in Karamoja in the 1960s and early 1970s. Social unrest, inadequate quantities of gum arabic collections and lack of an adequate market led to the collapsing of gum arabic collection as an economic activity. In Karamoja, gum arabic is largely produced from *Acacia senegal* (L.) Willd. *Acacia seyel* Del., *Acacia sieberiana* DC, *Acacia nilotica* (Guill. Et Perrott.), *Acacia gerrardii* Benth., *Acacia polycantha* (Willd.) and *Acacia tortilis* (Forsk.). These species constitute the Karamoja gum tree belt that makes up more than 60% of the vegetation of the region. The gum tree belt covers the districts of Kotido, Moroto, Nakapiripirit, Kumi, Katakwi, Lira, Kitgum and Pader.

In spite of a recent renewed interest in gum arabic trade in Uganda, there is little documented information with regard to the local uses of gum arabic. Furthermore, little is documented about the potential uses of the trees species that produce gum arabic that may limit its production to the Karamoja region. This study was carried out to identify tree species producing gum arabic and their other uses to the local communities

Materials and methods

Study area

The Karamoja region includes the districts of Kotido, Moroto and Nakapiripirit, covering an area of 27,319 km^2, approximately 10% of Uganda. The region lies approximately between 1°31′ to 4°N and 33°30′ to 35°E. At its lowest part in the extreme south the plain lies at 1130 m above sea level and rises gently towards the east reaching a height of about 1370 m at the Turkana escarpment and 1800 m at Timu forest in the north. The region is semi-arid with distinct wet and dry seasons, characterized by a hot and dry season lasting from November to March. The annual rainfall ranges from 500 to 700 mm per year in the drier zones of the east and central parts of the region, and 900–1500 mm per year in the wetter sub-humid zones in the extreme south and north. The mean annual minimum temperature is 15°C and the annual maximum is 30°C (NEMA, 1997a,b).

The vegetation of Karamoja ranges from thorn bush in the dry eastern and central parts to open or wooded grasslands in the western parts (Wilson & Rowland, 2001). The vegetation is characterized by communities that include: *Acacia–Commiphora* thickets, *Chrysopogon* grass steppe, *Lannea–Acacia–Balanites–Albizia–Dichrostachys* bushlands, *Acacia–Setaria*, *Combretum* savanna with patches of grassland and *Themeda triandra* and *Hyperrhenia filipendula* grass species in the lowlands. The vegetation has faced degeneration because of deforestation, overgrazing, fires and cultivation. Karamoja region has ten ethnic groups (Ngimatheniko, Ngibokora, Ngipian, Ngimogos, Ngimuno, Ngipei, Ngitome, Ngikaleeso, Ngimosingo and Ngikosowa), as well as the Suk or Pokot, the Jie, the Dodoth, the Tepeth, the Labwor, the Mening, the Nyakwae, the Nyangia and the Teuso (Wilson & Rowland, 2001). The total population in the region was 491,800 in 1991 of which the Karimojong constitute about 81% (Ministry of Finance, Planning and Economic Development, 1992).

Data collection

Seven of eight counties of Karamoja were visited during the preliminary survey to make contact with the local people and their leaders. The counties were Bokora, Chekwi, Dodoth, Jie, Matheniko, Pian and Pokot. A questionnaire survey, informed discussions and group meetings were employed as tools for data collection. The questionnaire survey was used to get information from a total of 210 (110 men, 100 women) respondents. Some questionnaires were in English while others were in 'Ngakarimojong'. The various respondents included the subcounty and parish chiefs, elders, warriors, forest department staff, agriculture department staff, district commercial officers, NGO representatives in Karamoja, community-based organization representatives, Church leaders and the business community. For most of the elders and warriors who were illiterate, the questionnaires were read and their responses recorded. The choice of respondents took gender balance into account, duration of stay in the area (≥20 years), and field livestock keepers, technical staff at subcounty and district levels. Data included uses of gum arabic, other uses of gum producing tree species by local people, and possible reasons for the collapse of the gum arabic trade that used to flourish in the past.

Informal discussions were conducted while walking in the field with local guides who were members of the community. A village map was drawn and used for accessing various locations. Informal discussions were also conducted in 100 households which were randomly selected during the group meetings organized by Local Council I of each selected village. Group meetings were organized by Local Council I chairpersons in each selected village without interfering with daily activities of the respondents. Such meetings functioned as a participatory rural appraisal exercise that yielded useful data to reinforce data from the questionnaire survey and informal discussions. Interviewing people as they carried out their activities yielded more useful information than group meetings. The survey responses were coded and statistically analysed using the Scientific Package for Social Sciences (SPSS Inc., Chicago, IL, USA) for Windows release 6.13 (1989–1995).

Results

Gum arabic-producing trees

Analysis of the respondents by occupation revealed that 75.6% were peasants, 8.5% herdsmen, 4.5% vigilante (security), 4.0% civil services and 7.5% were students. The local resource users identified six tree species as producers of gum arabic – *A. senegal*, *A. seyel*, *A. sieberiarina*, *A. gerrardii*, *Balanites aegyptica* and *Lannea humilis* (Table 1a). Only two of the six species mentioned did not belong to the genus *Acacia*. On the basis of use of gum as food and its marketability by the local users, the identified trees were ranked with *A. senegal*, *A. seyel* and *A. sieberiana* as the major producers respectively (Table 1b).

Table 1a Tree species that produce gum arabic in the Karamoja region

Species	Count	Response (%)
Balanites aegyptica	106	31.8
Acacia senegal	140	42.0
Acacia seyal	20	6.0
Acacia sieberiana	11	3.3
Acacia gerrardii	21	6.3
Lannea humilis	15	4.5
Mature trees	20	6.0
Total	333	100

Zero missing cases and 210 valid cases.

Table 1b Ranking of gum-producing tree species by the resource users in the Karamoja region

Position	Species	Respondents (n)	Respondents (%)
1	*Acacia senegal*	196	93
2	*Acacia seyal*	183	87
3	*Acacia sieberiana*	148	70.5
4	*Acacia gerrardii*	51	24.3
5	*Balanites aegyptica*	38	18.1
6	*Lannea humilis*	6	2.9

Uses of gum arabic

The local people knew and had heard a lot about gum arabic. They stated ten different uses that relate to gum arabic (Table 2). The common uses of gum arabic by the local people were food, gumming spears onto handles and mending broken pots. The herdsmen knew gum arabic as a source of food. The local resource users observed that *A. gerrardii* produced a lot of gum that was mostly eaten but was less preferred to gum from *A. senegal*. The gum was sticky and difficult to chew as it tended to get trapped between the teeth and gum. Gum arabic from *B. aegyptica* was identified as a good substance for maintaining weapons. The local people were security conscious and attached a lot of importance to the gum for maintaining their weapons. Knowledge about gum having industrial applications was common among students and civil servants but less among peasants.

Table 2 Knowledge of the local uses of gum arabic by the local community in Karamoja

Use	Count	Response (%)
Gumming spears	51	18
Joining leather	7	2
Food	74	30
Gumming pots	44	15
It is produced by *A. senegal*	20	7
Exchanged for money	18	6
Gluing arrows	22	7
Gluing broken calabashes	15	5
Gluing broken stools	15	5
Gluing broken wooden tools	15	5
Total responses	281	100.0

Zero missing cases and 210 valid cases.

Table 3 Uses of gum-producing tree species by the local people in the Karamoja region

Uses	Respondents (n)	Respondents (%)
Fencing	210	100
Fuel wood	150	71
Poles	139	66
Fibre	29	14
Intercropping	69	33
Crafts	120	57
Gum	126	60
Medicine	90	43
Tannins	29	14

Uses of trees producing gum arabic

Apart from producing gum arabic, the identified tree species had other local uses in the Karamoja region. Nine uses were identified by the local users with the most common ones being fencing, fuel wood provision, poles for construction, gum arabic production and crafts making (Table 3). All respondents mentioned the use of the tree species for fencing purposes. It was observed that the gum-producing tree species have medicinal properties.

All *Acacia* trees producing gum had more than one socio-economic and ecological use as shown in Table 4. All *Acacia* species were used for gum arabic production while *A. senegal* was used for all identified purposes except for the production of tannins.

Discussion

Acacia senegal, *A. seyel*, *A. sieberiana* and *A. gerrardii* were the common gum-producing tree species with *A. senegal* being the highest producer. Other non-*Acacia* tree species mentioned were *B. aegyptica* and *L. humilis*. These results agree with those reported by Von Maydell (1986). *Acacia senegal* was reported as the producer of the best quality of gum arabic as earlier reported by Coppen (1984).

The people in Karamoja have a great deal of knowledge about gum arabic, which is locally called 'Eminai'. There is a high level of interest among the local people on its production and the groups of people linked to gum arabic production were the peasants and herdsmen who used this resource mainly as food and for proper maintenance of weapons and pots. The local people found gum very important in their daily life for fixing their arrows and spears onto handles. From the local resource users' point of view, gum from *B. aegyptica* was the most reliable for gluing spears and arrows but not good for sale and food because it had a bad smell. The local people ate gum arabic mainly as wild food when grazing their livestock far from home and during times of famine. Gum from *A. gerrardii* was good for food but was less preferred to that from *A. senegal*.

Before the collapse of the gum trade, the local people collected and sold the gum. They went to the rangelands very early in the morning from the western side so that the gum could be easily identified in the early morning sun. Leather bags or sheets were used for transporting the raw gum. Thereafter, the waste was removed, and the gum was sorted according to species type, dried and then stored before being sold. Gum-buying centres existed in Moroto town and Matany trading centre in Moroto district, while in Nakapiripirit district the buying centres were at Lolachat and Amudat trading centres. No mention was made of any buying centres in Kotido district. Gum collectors delivered raw gum to these places and received cash payment on delivery. These centres are currently nonfunctional as the gum arabic trade has collapsed. Collectors were of two categories: the first were basically group leaders who were simple collectors but had changed to hire others to collect for them. They were mainly men who

Table 4 Uses of each identified gum-producing tree by the local people

Species	Fencing	Fuel wood	Poles	Fibre	Intercropping	Crafts	Gum	Medicine	Tannins
Acacia senegal	–	–	–	–	–	–	–	–	x
Acacia seyal	–	–	–	x	–	–	–	x	x
Acacia sieberiana	x	x	x	x	–	x	–	–	x
Acacia nilotica	–	–	x	x	–	–	–	x	–
Acacia gerrardii	x	x	x	x	–	–	–	x	x
Acacia polycanthus	–	x	x	x	x	–	–	–	x
Acacia tortilis	–	–	–	x	x	x	–	–	x

–, utilized; x, not utilized.

could deliver the gum to buying centres, receive payment and in turn pay the people they hired. The other group, mainly women and children in the age range of 5–12, collected the gum, processed and delivered the raw gum to the leaders for marketing. Sometimes they would market it themselves.

Gum trees serve many purposes. Promoting their conservation and planting would greatly benefit the Karamoja region. The Karamojong have attached social, economic and cultural values to all the tree species producing gum arabic reported in this study. They use them for several purposes beyond being a source of gum, e.g. fencing cattle kraals, charcoal burning, burning bricks, poles for building and craft making. These activities threaten the population of gum arabic-producing trees. *Acacia senegal*, the producer of the best quality gum arabic, has many other uses by the local people. The different uses of *Acacia Senegal* are expected to affect the production of gum arabic in the Karamoja region.

High densities of gum trees occured in those areas that were not used for cultivation and fuel wood collection due to aridity and insecurity. The extent of the wild habitat of gum arabic trees within the study area was therefore restricted to remote areas where human activity is minimal.

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