Land Degradation & Development

Market Chain Analysis of Gum Arabic Trade in Kenya

Journal:	*Land Degradation & Development*
Manuscript ID:	LDD-11-0166
Wiley - Manuscript type:	Research Article
Date Submitted by the Author:	15-Sep-2011
Complete List of Authors:	Wekesa, C; KEFRI, ECOLOGY Luvanda, Albert; KEFRI, Dryland research programme Muga, Meshack; KEFRI, Forest products programme Chikamai, Ben; KEFRI, Forest products programme Makenzi, Paul; Egerton University, Environmental science
Keywords:	Acacia senegal, Gum arabic, Market chain, Stakeholders, Constrair ts

MARKET CHAIN ANALYSIS OF GUM ARABIC TRADE IN KENYA

C. WEKESA[1], A. M. LUVANDA[2], M. O. MUGA[3], B. N. CHIKAMAI[3] AND P. M. MAKENZI[4]

[1] Kenya Forestry Research Institute (KEFRI), Coast Eco-Region Research Programme - Gede, P.O. Box 1078-80200, Malindi.

[2] Kenya Forestry Research Institute (KEFRI), Dryland Eco-Region Research Programme - Kitui, P.O. Box 892-90200, Kitui.

[3] Kenya Forestry Research Institute (KEFRI), National Forest Products Research Centre, P.O. Box 64636-00620, Nairobi

[4] Department of Environmental Science, Egerton University, P.O. Box 536-20115, Egerton.

Corresponding author. Chemuku Wekesa. Kenya Forestry Research Institute (KEFRI), Coast Eco-Region Research Programme, P.O. Box 1078-80200, Malindi. Email: chemuku@yahoo.com.

ABSTRACT

In Kenya, trade in gum arabic has remained informal due to inadequate marketing arrangements attributed to limited participation of gum arabic collectors in the development of the sector and a non-conducive business environment, which does not favor private sector expansion. This paper looked at the market chains of gum arabic, the stakeholders participating in the management and marketing of *A. senegal* products and the constraints to gum arabic production and collection within the Kenyan drylands. The results confirmed that the market chain of gum arabic was and is still poorly organized with only one company and a few individual traders being the major buyers. Wildlife related factors and price were the key constraints to gum arabic collection while production was limited by unreliable rainfall due prolonged droughts. Quality of the gum and road network determined the price with different grades attracting different rates per kilogram in different areas. SALTLICK and AWF were the chief stakeholders involved in *A. senegal* tree resources management. The study has shown that there is willingness of the locals to engage in full time gum collection if ready market can be availed to them. Nevertheless, numerous constraints need to be addressed to make gum arabic collection an attractive venture to the local communities' key among them being the purchase price.

Key words: *Acacia senegal*, Gum arabic, Market chain, Constraints, Stakeholders

INTRODUCTION

Gum arabic is a natural exudate obtained from *Acacia senegal*. Gum arabic is traded on both local and international markets. Around 90% of the total gum produced worldwide comes from *A. senegal*. Gum arabic is used in various industries such as food, beverages, medicine, soft drinks and chewing gums. It is also applied as an adhesive, as a protective colloid and safeguarding agent for inks, sensitizer for lithographic plates, coatings for special papers, sizing agent to give body to certain fabrics, and anti-corrosive coating for metals; it is also used in the manufacture of matches and ceramic pottery (Cossalter, 1991).

In Kenyan drylands, *A. senegal* var. *kerensis* is the main source of commercial gum arabic, and grows naturally in the wild where there are no plantations (Chikamai and Banks, 1993); the other varieties of *A. senegal* are var. *senegal,* var. *rostrata* and var. *leiorhachis* (Coe and Beentje, 1991). Apart from gum arabic production, it also enhances soil stabilization and soil fertility through biological nitrogen fixation thus contributing to the environmental conservation (Wickens *et al.*, 1996). The tree provides grazing and browsing material for livestock. Thus, *A. senegal* can provide a potential solution to land degradation in the ASALs. Moreover, its promotion and utilization can offer alternative livelihoods to the pastoralists and agro-pastoralists contribute to soil fertility and protect these fragile ecosystems from environmental degradation.

In the 1980s, the World demand for gum arabic declined as low as 27,500 metric tonnes annually. Although drought and insect attack affected many trees, poor prices paid to local producers/collectors were believed to be the principal cause in diminishing the amounts of gum arabic that were traded (Jamal and Huntsinger, 1993). However, in 1994, the annual demand picked up to 43,800 metric tonnes and the present demand stands at between 60,000 to 70,000 metric tonnes annually against current supply of 57,200 metric tonnes. The major suppliers are Sudan, Nigeria and Chad (Fagg and Allison, 2004; ITC, 2004). Sudan effectively controls about 85% of the World Market, with the West African countries Senegal, Mauritania, Mali, Chad, Niger and Nigeria supplying much of the remainder (Anderson, 1993). The European Community is the world's largest gum arabic importer trading in about 35,000 tonnes

yearly and the world imports have risen by 25% in the last 4 years (Muller and Okoro, 2004).

Studies show that the potential production of gum arabic from Kenya is about 3,000 metric tonnes per year (Muller and Okoro, 2004; Chikamai and Odera, 2002). However, currently, export volumes averages 300-400 metric tonnes per year, indicating that only 10% of the production potential of gum arabic is exported. This is largely as a result of bottlenecks related to production, quality, collection and more notably, poorly developed market organization that causes irregularity in supply (Chikamai, 2001). Currently, the price per tonne is around US$ 4,500, having risen from US$ 1,500 in the year 2003 and therefore all collection can be sold immediately at a good rate (Muller and Okoro, 2004; Chikamai and Odera, 2002). Thus, small producers such as Kenya can penetrate the market and increase their market share if they produce and export good quality of gum arabic that meet buyers' expectations and make profits (Chretin *et al.*, 2008).

Gum arabic production begins with the local farmer who collects the gum oozing out as natural exudates from the tree. Gum arabic collected in most cases is simply sold in its natural state with little or no processing. Even though gum arabic has been used and marketed for generations by local inhabitants in the drylands of Kenya where the commodity is abundantly produced, these activities seem to have gone unnoticed for a very long time (Chikamai, 2001). The activities continued to be carried out at informal level until well into the late 1980's when various organizations especially NGOs working in northern Kenya realized their commercial significance and the manner in which merchants were exploiting the collectors that they sought for a concerted effort to develop this important resource.

The market chain for gum arabic in Kenya is currently under-developed. Harvesters do not collect adequate quantities of gum arabic and the collection is on part time basis because they are not linked to buyers and they lack awareness on the trends of international market price (Chretin, *et al.*, 2008). As a result, they think that the prices they receive are low and this discourages the collectors from developing the sector as an income generating activity. Consequently, pastoralists only collect gum arabic when herding livestock as a secondary activity and do not tap the trees to enhance production besides using outdated harvesting techniques (Chikamai and Odera, 2002). The outcome is that Kenyan gum arabic has a reputation for low and variable quality reducing its competitiveness in the international market. Moreover, barely enough

gum is collected to meet the current market demand. Different players across the market chain who include collectors, buyers, agents and exporters stand to benefit from the commodity if they are more organized and if that business is more developed in the country (Chikamai, 2001).

There is unawareness by the communities living in drylands of Kenya on the profitable potential of gum arabic and the manner in which the business is carried out in an informal manner as earlier mentioned have led to the haphazard market structure for the product denying the local people from reaping maximum benefit from gum arabic. Apart from poor market arrangements, the nomadic communities in the drylands of Kenya experience a number of constraints ranging from gum arabic collection related difficulties in addition to environmental and human related factors that hinders gum arabic production from *A. senegal* trees. This study was undertaken to establish the market chain of gum arabic, the major players involved in the management of *A. senegal* trees for gum arabic production and to identify the constraints to gum arabic production and collection in order to come up with strategies on how to overcome these constraints for increased yields of good quality gum arabic and hence provide suggestions on how to improve the market structure for gum arabic to enhance regular supply to both local and international markets.

The objectives of this study was to build a typology of the actors participating in gum arabic production, collection and marketing; to carry out an assessment of the gum arabic commodity chain and to identify factors limiting gum arabic production by *Acacia senegal* trees and the subsequent collection.

RESEARCH METHODOLOGY

The data presented below were collected during a field survey on gum arabic market chain, stakeholders involved in the management of *A. senegal* trees and the constraints to the production and collection of gum arabic in Isiolo and Samburu Districts of Kenya.

Both primary and secondary data were collected to complement each other. Primary data were gathered from sampled households or homesteads from local communities in the study areas. 149 representative households from the local communities in Ngare Ndare, Daaba, Nantudo and Churuviare in Isiolo District and West Gate and Sereolipi in Samburu District were randomly selected for the household interviews. Respective respondents, either the husband or wife or a child aged over 14 years were

interviewed using structured questionnaires. A total of ten focused group discussions (FGDs) were held through peer discussions, consultations and active participation. These stakeholders included a team of researchers, informed community members, local leaders and officials from government departments, private sector and NGOs. Secondary data and information were collected from previous related studies, government departmental reports, gum traders and agents, CBOs, private companies and reports from NGOs.

Issues covered by the questionnaire included quantities of gum arabic collected, how the collection is organized, where the locals sell the commodity, the price per kilogram, the main actors participating in the development of the resource and the constraints to production and collection of gun arabic. Private companies and NGOs were interviewed on the institutional arrangements, their associations with local communities and their level of involvement in promoting the development of gum arabic as an alternative source of livelihoods for poverty alleviation and environmental conservation in the drylands of Kenya.

Data analyses were conducted by use of SPSS version 11.5 and Excel computer software programs. All the data collected were summarized and subjected to descriptive statistics involving computation of sums, means, and standard deviations. This process permitted the production of summaries of representative practices. The field results were presented by use of graphical and tabular techniques.

RESULTS AND DISCUSSION

Gum arabic collection

Generally, gum arabic collection was done on individual basis and women were the mainstream collectors on full time basis. Nevertheless, few people collect gum arabic on part time basis especially children as they fetch water and fuelwood or when herding livestock. On average, one person per household was involved in gum arabic collection on full time basis whereas two persons per household collected gum arabic on part time basis indicating that presently, only a small number of pastoralists are involved in that sector to a significant level in spite of the presence of *A. senegal* in abundance in Kenyan drylands.

Marketing of gum arabic

There was a significant presence of buying agents in all the areas surveyed. The agents buy the bulky of the gum collected in its raw form without any value addition.

The supply chain of gum arabic in Isiolo and Samburu Districts is structured in such way that at primary level there are collectors who harvest the gum arabic from *A. senegal* trees in their natural stands. Thereafter, these collectors sell the gum to the local agents of major exporters and few wholesalers in Isiolo and Nanyuki towns who export it to overseas markets (Figure 2). Largely, the major market for Kenyan gum arabic is the export market.

The local market for gum arabic was limited to only one company known as Arid Land Resources Limited (ALR) based in Nanyuki town and few individual traders of Somali origin who buy it from the local agents. According to the local dealers, trade in gum arabic required a minimum sum of Kshs. 2 million as a start up capital. This sum of money is beyond the reach of many local entrepreneurs leaving very few players in the trade.

The pricing of gum arabic

The minimum price of gum arabic per kg offered by local agents was Kshs. 25 whereas the maximum price was Kshs. 80. However, the average price was Kshs. 39/kg. The local price for gum arabic varied by site, agent, grade and quality supplied to the market. At collector level, first grade gum fetched Kshs. 50 per kg while second grade fetched Kshs. 30 per kg. The exporter at the port received Kshs. 150 and Kshs. 110 per kg for first and second grades respectively after selling the gum to the final consumer companies overseas. This means the collector gets a third of the final export price (Table 2).

Comparing the price in different areas at the period of study, gum arabic collectors received higher prices at Chumviare of Kshs. 50 per kilogram followed by Sereolipi, West Gate and Daaba (Kshs. 40 per kg). In Nantudo, a kilogram of gum arabic fetched Kshs.35 when sold to the agents. Ngare Ndare had the lowest price per kg of Kshs. 30 per kilogram. However, the variation in prices in the sites was not related to the quality of gum arabic. The difference in the prices can be attributed to the element of accessibility to the sites of potential buyers and since Chumviare and Daaba are near Isiolo town and the road network is fair as opposed to Nantudo, which has poor infrastructure and is impassable during rain season besides being very far, over 60 km away from Isiolo town, they attracted higher prices due to low cost of transport.

The respondents do not keep any record of their earnings. However, the approximate monthly income from gum arabic per household ranged from a minimum of Kshs. 200 to a maximum of Kshs. 8,000 while from livestock, it was between Kshs. 100 to

Kshs. 25,000. Livestock is simply sold whenever there was a financial problem such as the need for money to buy food or clothing. This means the income earned from sale of livestock was irregular making it difficult to estimate. The same scenario applies to earnings from gum arabic as some collectors do it on part time basis and collect gum only when they are in need of money to buy household basic requirements like food.

On average, the total amount of cash earned by full time collectors was higher than that of part time gum arabic collectors. Ngare Ndare led the other areas in terms of income received by collectors from the selling of gum arabic. This was attributed to high quantities of gum arabic collected per day per individual in the site as compared to the rest of the sites.

Comparison between income from gum arabic and other sources

Gum arabic ranked fifth in generating monthly income to the local farmers when compared with other sources of income fetching a mean average of about Kshs. 2,255 for an individual collector. Livestock, which earned individual farmer a mean of Kshs. 4,900 ranked first as shown in Table 2 below. Gum arabic collection was the most popular activity among the local communities. The other source of income includes resins collection and trade, wages, charcoal production and small-scale business.

STAKEHOLDERS PARTICIPATING IN *A. SENEGAL* MANAGEMENT AND GUM ARABIC TRADE

The survey established that several stakeholders have come up to assist communities to get maximum benefits from *A. senegal* trees and its products (Figure 3). Semi Arid Lands Training and Livestock Improvement Centers for Kenya (SALTLICK) plays a major part in the management of *A. senegal* trees and provides market opportunities of gum arabic to collectors. Arid Land Resources Limited (ALR), a subsidiary of SALTLICK, is based in Nanyuki was the lead company that regularly buys gum from collectors. The other organizations actively involved in supporting communities in the management and utilization of *A. senegal* resources for increased gum arabic production and it's flow in the market included; Africa Wildlife Foundation (AWF), Kenya Forestry Research institute (KEFRI), Ewaso Nyiro North Development Authority (ENNDA) and Kenya Forest Service (KFS).

A number of government agencies are carrying out research and development work on gum arabic. Key among them is the Kenya Forestry Research Institute (KEFRI),

which leads other organizations in promoting sustainable management of *A. senegal* trees for gum production as alternative livelihood to the pastoral communities through training of farmers on proper methods of establishment and management of gum trees as well as improved tapping techniques, sorting and storage of gum. Acacia Operation (AOP) activities are aimed at promoting sustainable management of gum producing trees for improved yield and quality of gum arabic.

Ewaso Nyiro North Development Authority (ENNDA) in collaboration with KEFRI are involved in the training of local farmers on gum arabic production and marketing with the ultimate aim of providing an alternative livelihood source for the local communities. This is achieved by imparting proven technologies and skills to extension staff and gum producers on the sound production of gum arabic. Farmers are also trained on improved gum harvesting techniques and value addition in order to increase returns for the collectors of gum. The training is organised at two levels: Training of trainers (TOTs) and training of local communities. However, KFS's involvement is only limited to protecting the acacia trees against illegal cutting.

Center for Training and Integrated Research in ASAL Development (CETRAD) is another government stakeholder whose mandate is the development of ASALs, and focuses on the assessment and evaluation of the potential and the utilization of the resources in the ASAL areas. However, CETRAD's involvement in promoting gum arabic production and collection is restricted to Daaba where they have constructed a store in collaboration with a local community-based organization (CBO) known as Mandate the Future (MTF).

Mandate the Future (MTF) is a registered as a community-based organization (CBO), which was started, in 2000 and has seven active members distributed in Oldonyiro, Daaba, Chumviare, Ngare Mara and Garba Tulla. The objective of the group is to improve the livelihood of pastoral communities through increasing their income hence reduce environmental degradation, to envision the community through the protection of gender where women and children participate in collection and packaging of gums and to enhance gums and be realized as a source of income to the communities. The CBO has been full of life in community training that covers aspects of species protection, tapping techniques, grading (cleaning and sorting), packaging and carrying out surveys on existing and potential gum arabic markets, linking the community to the market and information sharing.

Malakino Women group is another CBO that is enthusiastically engaged in gum arabic trade. The word Malakino means "*I will never be defeated*". The CBO is situated in Sereolipi, Waso Division, in newly created Samburu East District. Major roles of the group include; gum collection, *A. senegal* plantation establishment and livestock marketing. The CBO buys gum from the collectors in the neighborhood and sells it to Arid Lands Resources limited Company at Nanyuki. It is also involved in the management of *A. senegal* plantations established under the Acacia Operation project.

Various NGOs are as well involved in the management of *A. senegal* resources key among them being Africa Wildlife Foundation (AWF) which has put up gum arabic collection stores in Chumvia e and Nantudo. Africa Wildlife Foundation also trains collectors on how to sort, store and package gum in order to preserve quality by holding seminars and workshops with the farmers. Through its effort, committees have been formed in most areas producing gum to oversee the management of the stores and promote marketing of gum arabic.

CONSTRAINTS TO GUM ARABIC PRODUCTION AND COLLECTION

Climatic factors

Unreliable rainfall pattern (51.0%) and drought (7.4%) were cited as the key factors limiting gum production/yield. 13.4% of the respondents attributed that both rainfall and drought influenced yields of gum arabic while 28.2% declined to give any response (See Table 4).

Water is essential to growth and survival of the *A. senegal* trees. The average annual rainfall in Isiolo and Samburu Districts was perceived to have a huge impact on the amount of gum arabic collected. The effect of long-term droughts causes great reduction in gum arabic production. Historically, gum collection seasons that follow droughts in the two Districts have been characterized with reduced output of gum arabic. This confirms earlier reports by several authors including Anderson (1993) and Luvanda *et al* (2006) who confirmed that long and severe droughts resulted into low gum arabic yields. The length of the rainy season is also a limiting factor. Longer rainy seasons extend the growing period for the trees eating into gum production season and hence reduction in quantity collected agreeing with Jackson (1968) who stated that for wet and cooler climates, though the tree may flourish; it yields no gum.

Limited availability of water and labor in the production zones

In the dry areas of Isiolo and Samburu Districts where we have natural populations of *A. senegal* trees, it was noted that there was a lack of labor for undertaking the tapping and collection of natural exudates of gum arabic due to conflicting household chores especially for women who are the ones actively involved in gum arabic collection. Inadequate labor is directly related to the lack of water in these areas. This is because lack of water forces women who are the majority collectors of gum to spend more time looking for it at the expense of gum collection. Men on the other hand herd their livestock moving from one place to another in search of pasture and water leaving little room for gum collection (Table 5).

Poor infrastructure

The importance of a reliable road network for easy collection of the gum arabic cannot be over-emphasized. In the remote production areas of the two Districts, in Nantudo for example, the road network is non-existent. The only access is by an uncovered road that is impassable during the rainy season due to the presence of intermittent rivers that do not have bridges. Many other areas with gum producing trees are in a similar situation and suffer generally from isolation from the rest of the region on the account of poor roads. This situation hinders regular collection of gum by buyers/traders from their agents disconnecting collectors/agents and buyers and as such further discourages gum collection.

Low producer price of gum arabic

Price act as an incentive to collect or not to collect gum arabic and determine the actual amount collected. Prices paid to the collectors in the various producing areas are determined by the global market trends. This detailed survey carried out in the two Districts confirmed that the decisive factor determining the level of collection was the level of local producer prices. According to this survey, the local producer price had declined from 60 Kshs. per kg in 1990s to between 35-40 Kshs. per kg in 2008, a similar figure that was reported in earlier studies (Chretin *et al.*, 2008). This decline resulted in about 73.2% of the collectors suffering from a reduction in income forcing them to contemplate abandoning this activity. If the current trend continued, then over 50% of those responding declared that they would not collect gum during the coming years. This study approves previous results by Jamal and Huntsinger (1993) that poor prices paid to the local collectors were the principal cause in diminishing the amounts of gum arabic traded.

In these areas, it has been estimated that the collector/producer receives about one third of the final export price for his production. If this is the case, and on the assumption of a maximum yield of 1 kg per tree and a collection from 500 trees per person per season, then the 20,000 Kshs. is earned per person per season, which translate to 40,000 Kshs. annually because there are two seasons in a year. Thus, on average, monthly income from gum is 3,330 Kshs., a very small amount to support essential livelihood of family members involved in one month. Under these conditions, gum arabic can only be considered as a supplementary source of income in a holding that associates gum collection with livestock keeping. The only advantage of the income that comes from the gum source is in its timing because it arrives in the middle of the dry season when the needs of the collector are the greatest and can at least to a degree; carry over his or her family until the severe dry season is over.

Wildlife related factors

Elephants posed the greatest threats to the survival of *A. senegal* trees. They break the tree branches when browsing and at times uproot the trees thereby reducing its population and consequently, gum production. Baboons on the other hand feed on fresh gum oozing out naturally from the trees causing a reduction in the quantity collected by collectors.

Wild animals such as lions, leopards, cheetahs, elephants and snakes attack gum collectors hampering their efforts. Collectors have therefore been engulfed with fear of collecting gum individually due to these attacks. They cannot go beyond some hours because of this wildlife coercion. Results of the present study confirm previous reports by Chikamai and Odera (2002) on the constraints to gum arabic collection.

Insecurity

Insecurity is a serious limitation to gum collection in the Districts. Cattle rustling and banditry were the main causes of insecurity in the sites. When these unfortunate events occur, collection is stopped until the situation cool down.

Cultural beliefs

Traditional beliefs especially among the Samburus whereby young boys (*morans*) who have undergone initiation into adulthood are not allowed taking up gum collection as an economic activity. This was attributed to the cultural beliefs that limit *morans* to herding of livestock hence relegating gum collection responsibilities to women and girls. The involvement of women in gum collection remained constant

throughout the six study areas irrespective of tribe. This clearly showed that women are the major collectors of gum arabic. However, among the Turkana community, there was no cultural beliefs barring family members from collecting gum on the grounds of gender and/or age and as a result, all family members undertook collection; men, women and even children.

Other bottlenecks to gum collection included; injures caused by thorns of *Acacia senegal* trees, denying collectors access to tree hence hampering smooth collection of gum arabic, tribal border inter community wars and trekking very long distances to reach areas inhabited with large population of gum producing trees.

OVERCOMING CONSTRAINTS TO GUM ARABIC COLLECTION

Majority of the respondents (26.8%) reported that they carry water and food to the bush whenever they went to collect gum. Carrying packed food and water to the sites during collection of gum arabic was a strategy that was observed in all the six survey sites. However, this strategy was deeply entrenched in Ngare Ndare followed by Daaba, Nantudo and Sereolipi in that order. Notwithstanding, 23.5% reported that they were always watchful when collecting gum for any attacks from wild animals like elephants, cheetah, snakes and lions. Another 25.5% entrusted their security in God's hands especially in Chumviare because there was very little they could do to protect themselves. They argued that the government had neglected them by failing to stump out insecurity in the area resulting from cattle rustling, banditry and human-wildlife conflict. In addition, collectors walked in groups (16.8%) to enhance their safety. Only 7.4% of the respondents camped in the sites with high population of gum arabic producing trees for days to collect gum and while in the camp, they lit borne fires to scare away wild animals.

CONCLUSIONS

The study has shown that there is potential for high gum arabic production in the two Districts because of high population of *A. senegal* trees and willingness of the locals to engage in fulltime gum collection if ready market can be availed to them. Nevertheless, numerous constraints need to be addressed to make gum arabic collection an attractive venture to the local communities' key among them being the purchase price. This problem can be addressed urgently through creating public awareness on the international trends of the commodity prices to make the collectors understand that the amount being offered at any given time is in tandem with global market prices trends and therefore local traders/agents do not in any way exploit them.

Moreover, the infrastructure needs to be developed and/or improved to ease the problem of accessing the gum producing zones by potential buyers to create a link between collectors and buyers. International and local NGOs as well as CBOs have played and still play a major role in the management of *A. senegal* trees as well as in the training of farmers on better gum arabic harvesting techniques in addition to constructing gum stores for the locals. The impact of NGOs and CBOs is being felt on the ground and much has changed for the better since their entry into developing gum arabic as a dryland resource.

Improvements can be made to harvesting and marketing of gum arabic. This can be achieved through training with specific attention to quality issues and international market trends in prices, establishing of stores in gum arabic producing areas and developing of direct links between collectors and traders. Once the above concerns are addressed, Kenya can penetrate the international market of gum arabic and improve its market share.

Various initiatives have been undertaken by a number of stakeholders mainly CBOs, NGOs, private sector operators and government agencies in the industry and are already showing promising results. SALTLICK through its subsidiary company; Arid Land Resources Limited (ALR), Africa Wildlife Foundation (AWF) and Kenya Forestry Research Institute (KEFRI) are leading the pack in ensuring that the resource is developed for the benefit of local communities and the country at large.

RECOMMENDATIONS

(a) There is need to formulate policies and investments that will support improved gum arabic collection and market structure since this will generate additional income for collectors, thus contributing significantly to extreme poverty alleviation in the ASALs. Such measures will also help increase the level of domestic value-added; which would have a positive effect on the country's export volumes and hence overall economic growth.

(b) There is an urgent need to strengthen the capacity and ability of gum collectors and other stakeholders to produce, collect and market high quantities of gum arabic of good quality in order to increase income, create jobs and diversify Kenyans foreign exchange earning.

ACKNOWLEDGEMENT

I would like to thank the following people who were very instrumental during data collection: Mr. Abdi Somo who was our field assistant, Mr. Kalapata of MTF and Mrs. Pauline of MWG. Gratitude also goes to Arid Lands Resource Management Project (ALRMP), Kenya Forestry Service (KFS), local communities, collectors, traders, and various NGOs and CBOs involved in the gum arabic sector. Special thanks to EU and KEFRI, which funded this study through ACACIAGUM project.

REFERENCES

Anderson DMW. 1993. Some factors influencing the demand for gum-arabic (*Acacia senegal*) (L.) Willd.) and other water-soluble tree exudates. *Forest Ecology and Management* **58:**1-18.

Chikamai BN. 2001. Status of the Gums and Gum Resins Sub-sector in Northern Kenya and Opportunities for Commercial Development. A Consultancy Report Prepared for Techno Serve Inc.

Chikamai BN, Odera JA. (eds). 2002. Commercial Plant Gums and Gum Resins in Kenya. Sources of Alternative Livelihood and Economic Development in the Drylands of Kenya. Executive Printers. Nairobi-Kenya.

Chikamai BN, Banks WB. 1993. Gum Arabic from *Acacia Senegal* (L) Willd. in Kenya. Food Hydrocolloids **7**(6)**:** 521-534.

Chretin MM, Chikamai BN, Loktari PE, Ngichili J, Loupa N, Odee D, Lesueur D. 2008. Gum arabic production and collection in Kenya: market and feasibility study. Embassy of France in Kenya, IFRA Nairobi, CIAT, CIRAD and TSBF Institute. 64 pp.

Coe M, Beentje H. 1991. A field guide to the Acacias of Kenya. Oxford, UK; Oxford University Press 1-148.

Cossalter C. 1991. *Acacia senegal*: *Gum tree with promise for agro-forestry*. NFT Highlights, No. 91–02.

Fagg CW, Allison, GE. 2004. *Acacia senegal* and the gum arabic trade. Oxford Forestry Institute, Department of plant sciences, Tropical forestry papers, University of Oxford. 261pp.

Jackson JG. 1968. An account of the Empire of Morocco and the districts of Suse and Tafilelt, 3rd Edition, Routledge.

Jamal A, Huntsinger L. 1993. Deterioration of a sustainable agro-silvo-pastoral system in the Sudan – The gum gardens of Kordofan. *Agro-forestry Systems* **23**: 23-38.

Luvanda AM, Choge SK, Chikamai BN. 2006. The role of *Boswellia* species in the livelihood of local communities in Wajir District. In Muchiri, M.N., Kamondo B., Tuwei, P. and Wanjiku, J. (eds) 2007. Forestry research for environmental conservation, improved livelihoods and economic development: Proceedings of the 3rd KEFRI Scientific Conference, Muguga, Kenya, 6 - 9th November 2006.

Muller D, Okoro C. (eds). 2004. Production and marketing of gum arabic. FAO/NGARA/ITC, 80 pages.

ITC. 2004. Proceedings on International Test Conference, October 26-28, 2004, Charlotte. ISBN 0-7803-8581-0, USA.

Wickens GE, Seif El Din AG, Sita G, Nahal I. 1995. Role of Acacia species in the rural economy of dry Africa and the Near East. FAO Conservation Guide No. 27, Roma, Italy, 1-56.