Traditional Ecological Knowledge Associated with Acacia senegal (Gum arabic tree) Management and Gum Arabic Production in Northern Kenya

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SUMMARY

This study documented traditional ecological knowledge (TEK) on the management of Acacia senegal trees (Gum arabic trees) using a structured questionnaire. A total of 149 randomly selected respondents from six locations in two districts of Samburu (Rift valley Province) and Isiolo (Eastern Province) were interviewed. Results show that local communities use their indigenous knowledge to manage natural gum arabic tree resources to sustain and improve their livelihoods. Restriction to the collection of only dead and fallen wood, community by-laws and nomadism were the main conservation strategies employed by the locals to protect gum arabic trees. Collection of gum arabic from wild gum arabic trees was mainly done by women during the dry months of the year. June to September season yielded higher quantities of gum arabic than the January to March season. More gum arabic was collected from gum arabic trees located on hilly and rocky sites than on plain and flat areas and along riverbanks. Small sized trees with small girth were prefered to big trees with a wide girth during gum arabic collection. Apart from harvesting gum arabic from the trees and selling it to earn cash income, the local communities get fodder, fuel wood, traditional medicine, fencing material and fiber from the trees. Besides, gum arabic is used as food during hunger season. There is strong evidence that TEK is a useful concept for sustainable management of gum arabic trees and could be used in designing of sustainable conservation and exploitation strategies of gum arabic trees and consequently environmental conservation.

Keywords: Acacia senegal, resource management, gum arabic, traditional ecological knowledge, local communities

Connaissance écologique traditionnelle associée à la gestion de l' Acacia senegal (arbre à gomme arabique) et à la production de gomme arabique dans le Kenya du Nord

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Cette étude a documenté la connaissance écologique traditionnelle (TEK) sur la gestion des arbres Acacia senegal (arbres à gomme arabique) en utilisant un questionnaire structuré. Un total de 149 individus sélectionnés au hasard dans six locations des deux districts de Samburu (province de la Rift Valley) et d'Isiolo (province orientale) fut interviewé. Les résultats montrent que les communautés locales utilisent leur propre connaissance pour gérer les ressources naturelles d'arbre à gomme arabique pour soutenir et améliorer leurs revenus. La restriciton de la récolte au bois mort, ou tombé, les règlements communautaires et le nomadisme étaient les principales stratégies de conservation utilisées par les personnes du pays pour protéger les arbres à gomme arabique. La récolte de la gomme arabique sur les arbres sauvages était principalement effectuée par les femmes durant les mois secs de l'année. La saison Juin-Septembre produisait une plus grande quantité de gomme arabique que celle de Janvier-Mars. La récolte de gomme arabique était supérieure sur les sites de collines et de rochers que sure les sites de plaines, de terres plates et que sur les berges des rivières. Les petits arbres à petite circonférence étaient préférés aux grands arbres à large circonférence durant la récolte de gomme arabique. Outre la récolte de la gomme arabique des arbres et sa vente pour pourvoir à leurs revenus, les communautés locales obtenaient des arbres du fourrage, du bois de combustion, de la médecine traditionnelle, du matériel pour les barrières et de la fibre. De plus, la gomme arabique est utilisée comme nourriture pendant la saison de la faim. Les preuves sont fortes que la TEK est un concept utile pour la gestion durable des arbres à gomme arabique, et qu'elle pourrait être utilisée dans la conceptualisation d'une conservation durable et de stratégies d'exploitation des arbres à gomme arabique, et par conséquent, dans la conservation environnementale.

El conocimiento ecológico tradicional en relación con la gestión del árbol de goma arábiga (Acacia senegal) y con la producción de la goma arábiga en el norte de Kenia

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Este estudio utilizó un cuestionario estructurado para documentar el conocimiento ecológico tradicional (CET / TEK) en lo que se refiere a la gestión de árboles de la especie Acacia Senegal (goma arábiga). Se entrevistó un total de 149 encuestados seleccionados al azar en seis

lugares de dos distritos de Samburu (Provincia del Valle del Rift) e Isiolo (Provincia Oriental). Los resultados muestran que las comunidades locales utilizan sus conocimientos indígenas para manejar los recursos de Acacia Senegal con el fin de sostener y mejorar sus ingresos familiares. Las principales estrategias de conservación empleadas por las comunidades locales para proteger los árboles de goma arábiga son las restricciones que sólo permiten recoger madera muerta y caída, las ordenanzas municipales y el nomadismo. La cosecha de goma arábiga de árboles salvajes se realiza durante las temporadas secas del año, principalmente por las mujeres. La temporada seca de junio a septiembre produce mayores cantidades de goma arábiga que la de enero a marzo, y se cosecha más goma arábiga de árboles ubicados en parajes empinados y rocosos que en zonas planas y de llanura, y en las riberas de los ríos. Para la recolección de goma arábiga, se prefiere los árboles pequeños de diámetro reducido a los grandes de mayor diámetro. Aparte de cosechar goma arábiga de los árboles y venderlo para ganar ingresos al contado, las comunidades locales utilizan los árboles para sacer pienso, madera combustible, medicinas tradicionales, material para fabricar cercas y fibra. La goma arábiga se utiliza además como alimento durante temporadas de hambre. Parecen existir pruebas contundentes de que el CET es un concepto válido para la gestión sostenible de árboles de goma arábiga y que podría ser utilizado a diseñar estrategias sostenibles de conservación y explotación, y por consiguiente podría contribuir a la conservación del medio ambiente.

INTRODUCTION

Arid and Semi Arid Lands (ASALs) cover 84% of Kenya's total land surface and support about 9.9 million Kenyans, which is approximately 34% of the country's population. They also account for more than 80% of the country's eco-tourism interests, 60% of the nation's livestock, and up to 75% of wildlife population (Republic of Kenya 2002, 2005). The drylands of Kenya are endowed with a rich diversity of plant and animal resources that inhabitants have used and marketed locally for generations (Chikamai and Odera 2002). The edible forest products in ASALs constitute important and cheap sources of vitamins, minerals, proteins, carbohydrates and fats, and their contribution to diet of local people is great (Okunomo and Bosah 2007). The dietary contribution of trees to improved nutritional status of humankind is further enhanced by the timing of their availability, which often falls at strategic periods of general food storage (Oni and Obadamosi 1998).

Among the forest trees in Kenyan drylands that produce edible products when the conventional staple foods are scarce is *Acacia senegal* commonly known as gum arabic tree. It belongs to the family Mimosoidae. Gum arabic tree is a legume, a deciduous shrub or shrub tree belonging to the subgenus, *Aculeiferum* (Arce and Blanks 2001). The species grows to 3-15 m tall with a flat or rounded crown (Maundu *et al.* 1999). It is very branched with many upright twigs (Von Maydell 1990). This species is a multipurpose African tree highly valued for centuries for gum arabic production, which is used in food, pharmaceutical and other industries (Anderson and Weiping 1992, ICRAF 1992). It also plays a secondary role in agricultural systems restoring soil fertility and providing fuel and fodder to livestock (Okunomo and Bosah 2007, Obua *et al.* 2006, Luvanda *et al.* 2006, Chikamai and Odera 2002, FAO 1995, Wickens *et al.* 1996, NAS 1979). Gum arabic is traditionally used for home consumption and also sold commercially to Somali traders (Watson and Van Binsbergen 2008, Chikamai and Odera 2002). It is also used as chewing gum or even eaten as food (Chikamai and Odera 2002, Watson and Van Binsbergen 2008).

A. senegal is widely distributed because it tolerates aridity and eroded soils (Chiveu *et al.* 2008). It is wide spread in tropical and sub tropical Africa, from South Africa northwards to Sudan (Raddad *et al.* 2005). In Kenya, the gum arabic tree grows on Homa hill in the Rift valley, Lokitaung and Mutha hill in dry *Acacia* commiphora bushland in dry areas (Chiveu *et al.* 2008). High densities and pure stands of this species have are found in many parts of northern Kenya.

Present management, conservation and utilization of *A. senegal* trees emphasizes modern scientific ecological principles and ignores the wealth of local knowledge and management experience, which exists across the drylands of Kenya (Barrow 1996). According to Barrow (1996), ignoring the traditional ecological knowledge, through external interventions and education systems perpetuates a neo-colonial and paternalistic perspective derived from agrarian and industrial based modern society, and is probably one of the factors contributing to the environmental degradation in the ASALs and the apparently endless poverty of the people living there.

People in ASALs largely depend on natural resources to support their livelihoods (Cox 1987). Sustainable use of these resources such as soils, pasture and more importantly gum arabic trees depend on local people's knowledge, management and ability to maintain and utilize them (Berkes 1989, Johannes 1989). What local people know about their surroundings, and how they categorize this knowledge, has an impact on what they do to their environment (Moran 1979). Thus, it is important to understand how people in ASALs survive and thrive, the reasons for their various activities, and the mechanisms, both technical and social they have put in place to make use of natural resource like gum arabic trees can contribute to the improvement of their livelihoods (Coppen 1984).

Consequently, traditional ecological knowledge is of fundamental importance in the development of sustainable management practices and use of gum arabic trees and their products. This is because traditional ecological knowledge allows research and extension activities to appropriately target constraints experienced locally (Chikamai and Odera 2002). Additionally, the use of TEK may benefit development agencies in providing more realistic evaluations of the role of gum arabic trees in the management of the environment and production systems (Chikamai and Odera 2002). Thus, involvement of local people's knowledge in the planning process improves the chance of success in bringing about rural development and livelihoods diversification among the pastoralists (Warren *et al.* 1993, Little *et al.* 2001).

In the ASALs of Kenya, gum arabic trees are managed under traditional land use systems involving integration of pastoralism into management of trees. However, TEK relating to the management of gum arabic trees for gum arabic production is not well documented. Documentation and analysis of traditonal ecological knowledge is vital in enhancing development of products from *A. senegal* particularly gum arabic which has numerous industrial applications especially in food and pharmaceutical industries. Besides, TEK associated with management of gum arabic trees for gum arabic production can be used as a basis for sound inventory, monitoring and management of this important local resource in order to diversify income sources among pastoralists in northern Kenya for improved livelihoods. Thus, there is need to establish the traditional ecological knowledge associated with management of this species and gum arabic production. The objectives of the study were to investigate and document traditional ecological knowledge associated with gum arabic trees management and gum arabic production and to investigate the multi-purpose uses of gum arabic trees.

RESEARCH METHODS

This research was undertaken in Samburu District, Rift valley Province and Isiolo District, Eastern Province of Kenya between April and May 2008. Two main ethnic communities surveyed were the Samburu and the Turkana. Turkana tribe is the second largest pastoral community in Kenya after the Maasai while the Samburus are semi-nomadic pastoralists. The information on TEK associated with management of gum arabic trees for gum arabic production was gathered through field observations, structured interviews of households and focus group discussions with key informants, government officers and NGOs personnel (Little *et al.* 2001). Six locations were selected from the two Districts for interviews (Figure 1). These were Ngare Ndare, Daaba, Nantudo and Chumviare (Isiolo District) and West Gate and Sereolipi (Samburu District). All the households within each location were enumerated and assigned numerical numbers. Thereafter, the households interviewed were randomly selected from each location of study using Excel stata computer programme. One hundred and forty nine households were selected for interviews where either the husband, wife or a child aged over 14 years was interviewed using a structured questionnaire (Table 1). Focused group discusions (FGDs) were also held with key informants mainly the community elders who have tremendous traditional ecological knowledge associated with gum arabic trees to obtain exremely valuable information which we could not be able to get from the normal household respondents. Moreover, FGDs were held with government officers from National Environment Management Authority (NEMA), Kenya Forest Service (KFS), Arid Lands Resources Management Project (ALRMP) and Ewaso Nyiro North Development Authority (ENNDA) and even NGOs/ CBOs that included Mandate the Future (MTF), African Wildlife Foundation (AWF), Semi Arid Lands Training and Livestock Improvement Centers for Kenya (SALTLICK) and Malakino Women Group (MWG) (Table). The issues covered included traditional gum arabic trees management practices, conservation strategies, uses of the trees, cultural beliefs related to the species, seasonality, tools used for gum arabic harvesting and collection techniques, selection criteria of trees for gum collection and local habitat(s) of gum arabic trees. Data collected was analysed using SPSS version 11.5 and Excel computer software programs. Thus, all the data collected were analysed for descriptive statistics involving computation of frequencies of the various responses given by the respondents. Cross-tabulations were performed to determine the variation in various responses given by respondents in different locations studied.

RESULTS

The study revealed that gum arabic trees are managed under traditional land use system involving the integration of livestock production into management and conservation efforts of these important trees. The two ethnic communities employ three main strategies to conserve and utilise gum arabic trees sustainably (Table 2). The production of gum arabic in Isiolo and Samburu Districts is based entirely on wild collection in natural stands of gum arabic trees owned communally in reserved forests or in parks. Gum arabic is usually harvested from these natural stand of gum arabic trees by pastoralists who include poor members of the community; men, women and children as they collect water, fuel wood or look after livestock. Generally, collection of gum arabic is done individually (Table 3) and women are the main collectors on full-time basis (Table 4).

The collection season falls from January to March and from June to September because these are dry months of the year that follow the short and long rain seasons respectively (Table 5). The tools used during gum arabic collection include: machetes, forked sticks, long straight sticks and containers. Machetes were the most common tools used during gum arabic collection in all the sites followed by forked sticks. Stone was the least used tool by gum arabic collectors. However, the percentage response on the use of different tools during gum arabic collection varied between the two tribes and among the study locations (Table 6).

Age and size of the tree determine the specific trees selected for gum arabic collection as confirmed by 91.0% of the repondents while 5.0% and 2.0% said that they selected gum arabic trees for gum collection based on the colour of the bark and intensity of branching respectively (Table 7). The majority of the respondents in Daaba, Ngare Ndare and Nantudo reported that they collected large quantities of good quality gum arabic from gum arabic trees found growing on hilly and rocky sites (Table 8). On the contrary, a large number of those interviewed in Chumviare, Sereolipi and West Gate confirmed that they collect large amount of gum arabic from gum arabic trees growing in plain and flat areas free from rocks. Apart from Nantundo location, the

respondents agreed that they never collected gum arabic from tree growing along riverbanks (Table 8).

Gum arabic, fodder, fuel wood and traditional medicine were the main products derived from gum arabic trees in all the sites (Figure 2). This study established that women had a deep understanding of gum arabic trees and gum arabic production process than children and men who were believed to have a limited knowledge on gum arabic trees (Table 9).

DISCUSSION

Management and conservation of gum arabic trees was carried out sustainably and involved judicious use of the resource. The techniques used include nomadism and temporary livelihoods, laid down community by-laws and restriction to the collection of only dead and fallen wood material for domestic fuelwood needs. Nomadic pastoralism is a cultural system of livestock production defined by mobility of herds and households. This is considered primarily as a strategic instrument of enhancing pastoral production units. Nomadism enables the Samburu and Turkana pastoral communities to efficiently utilize the limited and spatially located range of gum arabic trees for pasture. This enables them to mitigate the effects of periodic droughts and erratic rainfall and the ensuing pasture shortage. Consequently, these communities use nomadism to cope with ecological variability and to conserve the environment. Their mode of gum arabic trees use follows spatial and temporal patterns of resource distribution. These two communities wander from one point to the other in search of pasture for their livestock to ensure that the land left behind is replenished for the future utilization. In this regard, nomadism directly enhances the growth of gum arabic trees in these arid lands.

Gum arabic trees'seeds are scarified by passage through the digestive system of livestock and taking advantage of the high organic matter on the sites previously occupied by livestock sheds, the seeds successfully germinate and grow better when the rains come. Consequently, nomadism facilitates the dispersal of seeds of gum arabic trees and hence enhancing regeneration of these dryland tree species. The grazing fields sprout up with all forms of vegetations including gum arabic trees shortly after the rain season. It was also observed that the localities of livestock sheds, where animal wastes are deposited after cleaning have high densities of saplings of gum arabic trees growing during the rain season. Thus, nomadism is a conscious environmental protection and management effort that promotes rapid regeneration of gum arabic trees hence increasing the stocking density of these important trees.

The Samburus and Turkanas manage, conserve and utilize sustainably gum arabic trees by enforcing laid down community by-laws. These trees are protected because they are seen as valuable resources and the two ethnic communities make a conscious effort to limit the manner of their exploitation through laid down local legislations. Thus, gum arabic trees that produce gum arabic and fodder that is consumed by sheep, camels and goats are not cut. According to the present study, the repondents confirmed that no gum arabic trees or parts of these trees may be cut when they are still alive. Besides, no herding sticks or tent poles are cut from gum arabic trees. Clearly, these restrictions are instituted in order to ensure survival of these important trees in these areas. For instance, among the Turkanas, the construction of traditional houses '*akol*' does not pose a serious deforestation threat because only fiddles from the branches are used and not poles and posts. Further, gum arabic trees that are seen to be obstructing livestock routes are gently pruned and not cut down. In the absence of such local legislations that enhance environmental protection and promote wise use of gum arabic trees, this area would long have been degraded.

Correspondingly, this study shows that among the Samburus, only dry and fallen dead wood is collected for fuelwood. This is done to protect the trees against destructive harvesting. Furthermore, the Samburu community consider charcoal production as a dirty work and as such, they are not at all involved in this activity. Similarly, cultural beliefs in Samburu community restrict young initiates ('*morans*') to herding of livestock and cattle rustling thereby denying them income diversification opportunities such as involvement in charcoal production and gum arabic collection. However, the Turkanas are actively involved in charcoal production, an activity they understand better than the Samburus. In fact, the Turkanas do not circumscise their young boys and hence, the young boys are allowed to actively participate in alternative income generating activities like charcoal production and gum arabic collection without any cultural barriers. Nevertheless, it is imperative to note that the Turkanas produce charcoal from specific tree species known as *Acacia tortilis*. *Acacia tortilis* is ranked by Turkana community as the best producer tree for quality charcoal. The production of charcoal from *Acacia tortilis* is supplemented by old and dead gum arabic trees, which are felled for charcoal production at an age when they can no longer produce any substantial amount of gum arabic. Thus, the Turkanas do not cut live gum arabic trees, but use dead trees and/or dead dry tree-parts mainly the branches for making charcoal. Besides, among the Turkanas, the utilization of gum arabic tree resource is organized so that the resource is used in a sustainable manner whereby gum arabic trees growing along luggas (transitory rivers) are not utilized for fodder during rain season but are spared for dry season. This practice enhances the stocking density and quality of gum arabic trees growing in these areas. Even though charcoal production is a common practice among the Turkanas and seen by conservationists as destructive to the environment, it does not threaten gum arabic production potential in Daaba and Chumviare.

Gum arabic collection season begins in January to March and June to September because these are dry months of the year and gum arabic production is regularly highest in the dry season when the leaves of gum arabic trees turn yellowish and start shedding off. This study confirms earlier report by Chikamai and Odera (2002) that the yield of gum arabic is usually high during the June to September season since it comes after the long rains than January to March season,

which comes after short rains, a claim that was confirmed by official scientific data in a follow up field experiment on seasonal variation in gum arabic yield (C. Wekesa, Egerton University, Kenya, personal communication). Women are the main actors involved in gum arabic collection. Other related studies (Chikamai and Odera 2002 and Luvanda *et al.* 2006) found that women were actively involved in gum arabic collection than men and children. This study shows that since women are the majority gum arabic collectors, they deeply understand gum arabic trees and the gum production process than men and children due to their regular interaction with the gum trees during gum arabic collection sessions. They can isolate the trees that are more productive and produce gum arabic with desired market characteristics with ease based on their long experience gained locally from their day-to-day contact with the trees.

As earlier indicated, the tools used during gum arabic collection include; machete, stone, forked and long straight sticks. The present findings on the tools used for gum arabic collection concurs with report by Chikamai and Odera (2002) which indicated that machete, stone, forked and long straight sticks were the main tools used for gum arabic collection by the two tribes. Nevertheless, results of this study deviate slightly from the results of Luvanda *et al.* (2006) who found that special axe, knife and machete were the main tools used for collection. Specifically, machetes are used to clear any thicket or vegetation surrounding the gum arabic trees in addition to making cuts on the tree stems and branches to induce gum arabic production. Besides, gum arabic collectors use stones to injure the trees to stimulate the production of gum arabic exudates. As observed during the study, the use of stones to induce gum arabic exudation by hitting the bark of the branches or stems of the gum arabic trees result into low quality gum arabic because gum arabic harvested as a result of this kind of tapping is contaminated with impurities mainly small and tiny pieces of tree bark. Stone tapping also causes more injury to the trees' cambium cells and does not allow the tapper to reach the tree branches, which are high up the tree with ease and as a result, it should be discouraged at all cost. This study revealed that forked and long straight sticks are used for pulling down tree branches that have gum arabic exudates for easy collection and hence concurs to a report by Chikamai and Odera (2002). However, it is recommended that a special tapping tool known as the sonkey should be used for tapping. This is because the sonkey causes less injury to the trees' cambium cells and gum arabic produced as a result of tapping using the sonkey is free from impurities, clean and consequently of good quality. Besides, the sonkey allows the tapper to reach the branches, which are high up the tree with ease as it is fitted with a long wooden handle.

Gum arabic trees are considered as a valuable resource by the two ethnic communities interviewed. Firstly, they produce gum arabic, which is harvested by the locals and sold to Arid Lands Resources Limited and Somali traders who in turn export it to overseas markets for use in food and pharmaceutical industries (Anderson and Weiping 1992, Watson and Van Binsbergen 2008). Moreover, gum arabic trees are important source of fodder in all the study sites in the two districts especially during drought season when pasture is very scarce. Mainly goats, sheep and camels feed on the pods of these particular trees while cattle and donkeys browse on the leaves of the trees. The tree is also used for fencing, fuel wood, poles and fibre production. Fencing of traditional houses and livestock sheds is mainly done using the branches that are pruned from gum arabic trees. Gum arabic is consumed in its raw form as a food supplement especially during severe hunger periods. Besides, gum arabic is used for treatment of backache and pain in the body joints. The bark of gum arabic trees is used in the treatment of stomach related illness. These outlined uses of gum arabic tree in this study conform to previous reports about the use of the species by several authors including NAS (1979), FAO (1995), Wickens *et al.* (1996), Chikamai and Odera (2002), Obua *et al.* (2006), Luvanda *et al.* (2006), Okunomo and Bosah (2007) and Watson and Van Binsbergen (2008).

Age and size of the tree were the main factors that led gum arabic collectors to selecting the kind of trees they target for gum arabic collection. Thus, preference was given to small sized trees with a basal diameter approximately the size of the arms wrist because they are easily accessible and more productive. Field experiments have shown that young gum arabic trees, which have a small girth, yield more gum arabic than old and big trees with a wide girth and are past the age of 20 years (Ballal *et al.* 2005, Wekesa *et al.* 2009). Besides, a fairly recent study by Luvanda *et al.* (2006) indicated that age and size of the tree were the key factors considered by locals in picking prospective gum arabic trees for gum collection. Big trees having wide girth produced less gum arabic because they are old and senile and that is why the locals rarely target them for collection (Chikamai and Odera 2002). Moreover, big trees are difficult to access especially the branches, which are high up the tree.

According to the respondents, gum arabic trees found growing along riverbanks (luggas) produce very little gum arabic or sometimes fail completely to produce gum arabic due to high moisture levels in the soil. Raddad *et al.* 2005, Gaafar *et al.* 2006 and Wekesa *et al.* 2009 found out that soil moisture has an effect on the yield of gum arabic with low soil moisture favoring increased gum arabic production while high soil moisture caused a reduction in the quantity of gum arabic produced by gum arabic trees. Accordingly, the respondents asserted that they do not collect gum arabic from these riverine gum arabic trees because of the low yield associated with them. In addition, very few trees if any found growing along luggas produce gum arabic. In contrast, soils in hilly and rocky sites tend to lose moisture very fast because they are sandy in nature. Hence, gum arabic trees found growing on hilly and rocky sites undergo desiccation at a more rapid rate once dry spell begins setting in, forcing the gum trees to counter the physiological stress by producing gum arabic to seal wounds present on the tree's bark either on the stem or branch in order to stop water loss. As such, gum arabic trees growing in the hilly and rocky sites yield high quantities of gum arabic and therefore, majority of gum arabic collectors preferred harvesting gum arabic from these trees located on hilly and rocky sites.

CONCLUSIONS

The study shows that TEK is a useful instrument employed by local communities in sustainable management of *Acacia senegal* trees to promote gum arabic production. As a result, the usefulness of local knowledge in the management of natural gum arabic trees cannot be overlooked. Apart from gum arabic which is produced by gum arabic trees in dry season and sold by the locals to earn cash income, gum arabic trees were widely used for fuel wood, fodder, human food, fencing, human medicine and fibre production. The utilization patterns of this important tree species varied between the two ethnic communities which have different cultural practices though the management and conservation strategies did not vary between the two ethnic communities. Young and small sized gum arabic trees with a small girth produce high quantities of gum arabic compared to big and old trees with a wide girth. Gum arabic trees growing on hilly and rocky places/sites as well as those ones growing in plain and flat areas free from rocks produce more gum arabic than gum arabic trees found growing along riverbanks/luggas. Moreover, gum arabic yield per tree varied with production seasons whereby June to September season yielded higher quantities than the January to March season. Thus, this study has demonstrated that the future sustainable management and conservation of gum arabic trees in the ASALs of Kenya lies in the rational use of TEK to complement modern ecological principles based on science. This calls for recognizing and creating awareness on the potential role of local people's knowledge and practices that exists in these areas on the management of gum arabic trees for production of economically valuable gum arabic and other tree products. There is therefore an urgent need to integrate both TEK and scientific ecological principles for effective management of *A. senegal* resources and conservation of the fragile dryland ecosystems where these resources are found. Besides, there is need to facilitate the communication and exchange of ideas, information, experiences and practices associated with TEK in the management of *A. senegal* resources and gum arabic production among relevant stakeholders in the sector.

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