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GUM AND RESIN RESOURCES IN ISIOLO DISTRICT, KENYA: ETHNOBOTANICAL AND RECONNAISSANCE SURVEY.

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Over 75% of Kenya is arid to semi-arid and is characterised by low biological productivity resulting from scant and erratic rainfall, a high evaporative demand and poor soils. Isiolo District, in which this study was conducted, falls within this environment. Because of the harsh environmental conditions nomadic pastoralism the most viable mode of production in the District. The main ethnic groups are: Boran who make 50% of the population, Somali (19%), Turkana (11), Samburu (9%) and Meru (8%). Apart from the Meru, others are nomads whose economic mainstay is pastoralism (Ministry of Planning, 1989). Vegetation is thus an important component to these communities for the provision of grazing and browse resources. It is also a source of fuelwood, fencing and building material, and a local medicine. The Government and several non-governmental organizations recognize this importance and have initiated a number of projects in the management of range resources to support the livelihood of local pastoral communities and stimulate livestock production.

However, livestock production is just but one source of livelihood that the rangelands of Isiolo support. Most of the woody resources (trees and shrubs) hold known or potential promise as producers of economically viable products. For instance gum arabic produced by Acacia senegal is an important article of commerce with various uses in the food industry (Robbins, 1987). Currently, Sudan is the leading producer, accounting for about 80% of world production. Gum talha, a gum of lesser value, is produced by *Acacia seyal* and has wide application in the non-food industries (Anderson, 1989). Species in the Burseraceae family are known to produce chemical products used in the pharmaceutical, cosmetic and food industries (Tucker, 1986). Myrrh and frankincense are the most important products from *Commiphora* and *Boswellia* species and until recently, Somalia was the world's leading producer of these products (Ali, 1986)

Accelerated economic development of Isiolo and similar areas therefore lies in recognising the potential that exists in the vegetation resources for the above products and incorporating them in the development strategy. This will ensure rational use of the resources and is particularly important as rapid increase in population puts pressure on the marginal areas bordering high population regions and the present trend towards sedenterisation among nomadic communities as a result of improvements in education. One advantage about the resources is their ability to produce gums and resinsonly in the dry season when forage is scarce, thereby allowing the communities to be occupied in a meaningful economic activity. The indirect benefits from these resources are many (NAS, 1979; Stiles 1988).

The present study reports work carried out between 1989 and 1991 to provide baseline information on the existing potential of Isiolo District in gum and resin resources for subsequent development. Preliminary investigations had indicated that local people had useful knowledge about various plant resources and the ethnobotanicle studies were considered desirable as part of the initial data base. Reconnaissance survey was also recognised as important in laying the framework for detailed ecological and inventory surveys and eventual planning for production.

MATERIALS AND METHODS

Preliminary investigations had revealed presence of abundant resources of gum and resin-producing species in two divisions of Isiolo district: Central and Garba tula (Fig. 1).

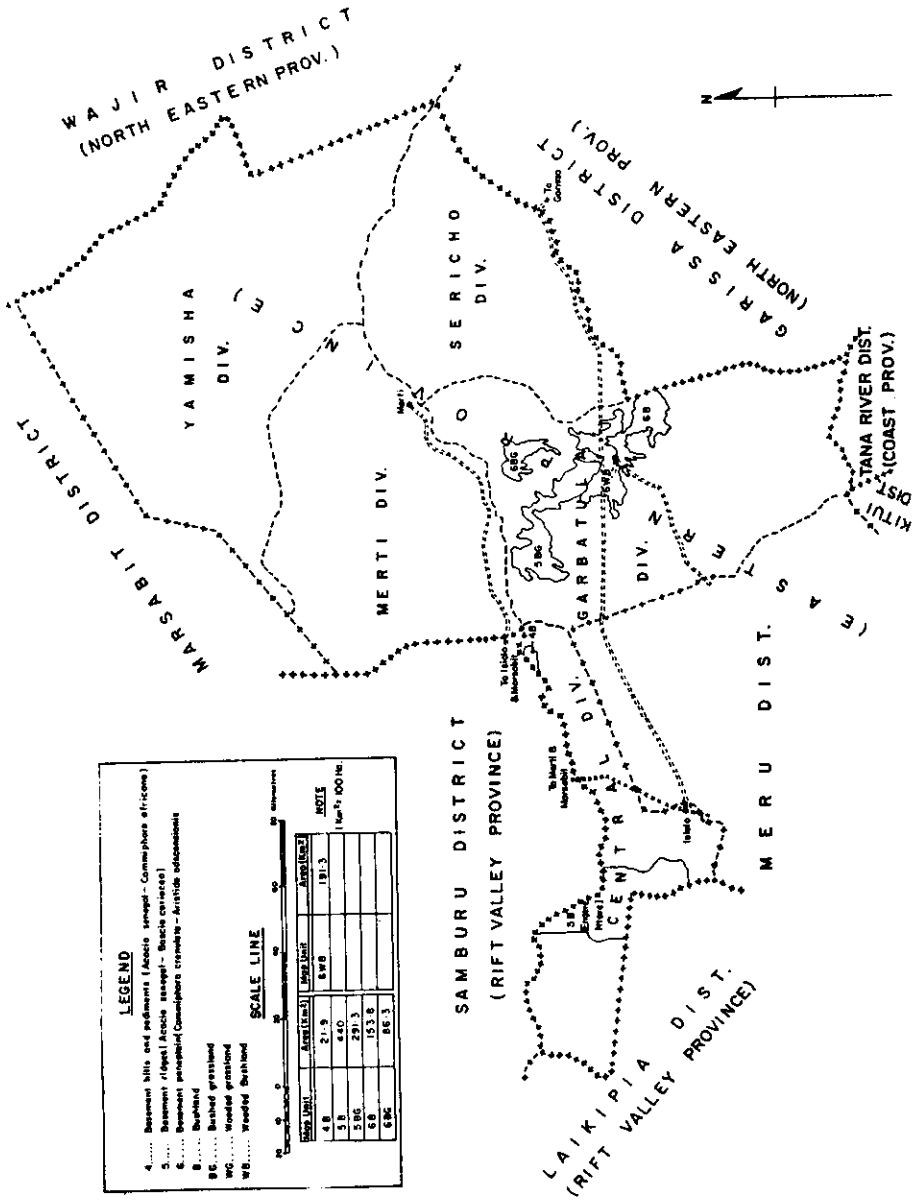

Fig. 1 - Vegetation map for gum and resin resources in Central and Garba Tula Divisions, Isiolo District

TABLE I - GUM AND RESIN SPECIES BY VEGETATION UNIT AND STAND

Vegetation unit	'8B								'5WBS					'4WB					4B		'6BG					'6BG					'6WB					'8B					Frequency
Stand	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
Species																																								
Acacia senegal	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*				*	*	*	*	*	*	*	*	*		*				*	*			30
Acacia seyal						*	*	*							*	*								*	*		*	*	*											10
Boswellia neglecta	*		*																						*	*			*	*	*	*	*	*	*	*	*	*	14
Commiphora campestris																																*	*		*	*	*			5
Commiphora confusa										*	*	*	*									*	*	*	*	*		*	*	*		*	*		*	*	*	*	*	20
Commiphora erythrea				*			=	=		=	=	=	=										*	*	*	*	*	*	*	*	*	*			*	*	*	*		21
Commiphora incisa																																*	*		*	*	*	*	*	7
Commiphora rostrata					*															*	*							*			*	*		*	*	*	*			10

Visits were made to the local administration for assistance in identifying local people with vast experience about trees and shrubs. Two Boran people from Garba Tula Division and four (two Turkana and two Samburu) from Central division were identified. Information on ethnobotany was acquired using a questionnaire. Interest was centred on the number of *Acacia, Commiphora* and *Boswellia* species growing in each area, those known to produce gum, myrrh (frankincense) and local uses of the products. Further information was sought on local techniques of identification and general knowledge on production. A site reconnaissance was then carried out to identify the species in the field and gain general idea on occurrence of the resources. To obtain required specimens for herbarium work as well as collect samples of gums and resins, two visits were planned: the first one was during the rain season in late October 1989 while the second one was during the dry season in February 1990.

Meanwhile, a vegetation map (EMI/ODA, 1990) was obtained from range unit section of the livestock production department in the district for the survey. Though meant for range purpose, the map had useful information as it subdivided the area into vegetation units showing predominant tree species. Units described as containing *Acacia, Boswellia* and *Commiphora* species or indicating bushland and shrubland were marked for verification and sampling. Transects were established in such a way that they were representative of the whole legend unit. Two types of units were distinguished: continuous and patchy. In the former, a transect on a set bearing was established at the unit boundary and the first sampling positioned 500 m inside the unit and away from the nearest road avoiding boundary and roadside effects. Three circular plots (0.1 ha each) were established at every sampling location. A centre one was positioned on the transect the other at 500 m away on a perpendicular bearing to each side. The objective of sampling three plots was to increase sampling intensity at each point. Identical set of three samples were enumerated at every 3-4 km, depending on whether the terrain was level or rugged. For patchy units, sampling was effected where there was extensive bushland or shrubland with transects used again for sampling, but aligned less formally depending on distances separating patches. A total of 39 samples were enumerated. Density counts of all species of interest were taken and recorded either by their scientific names, where positive identification was possible, or by their known vernacular names. In the latter case, herbarium specimens were collected for identification at the national herbarium.

RESULTS AND DISCUSSION

The ethnobotany of Acacia, *Commiphora and Boswellia* species is given below.

Acacia species

Acacia senegal var. kerensis (Schweinf.). Local names: Babito (Boran), Iderikesi (Samburu) and Ekunoit (Turkana).

Usually without a distinct trunk, the shrub or bush could attain the 5 m mark in height. The bark on trunk is greyish to dark brown and peels sometimes. Inflorescence axes pubescent. The species is dominant and major gum producer in both the divisions.

Acacia senegal var. leiorhachis (Brenan). Local names: Bura dima (Boran), Iderikesi (Samburu) and Ekunoit (Turkana).

This species grows up to a height of 12 m. It is characterised by long straggling branches, a yellow papery bark that peels on the trunk, and inflorescence axes glabrous or subglabrous. The tree produces edible gum and is scattered in the dry bushland area of Malkadaka in Garba Tula division.

Acacia seyal var. seyal (Del.). Local names: Wachu (Boran), Lorai (Samburu) and Ekoromait (Turkana).

Usually at 9 m in height with a flattened crown and a white or green to yellow bark on trunk, the species has slender spines that could be as long as 8 cm. It produces large quantities of clear gum and is common on the seasonally flooded black cotton soils in Central Division of the District.

Acacia seyal var. fistula (Schweinf.). Local names: Wachu (Boran), Lerai (Samburu) and Ekoromait (Turkana).

The presence of 'ant-galls' formed by fusion of pairs of spines that become inflated at the base distinguishes this species from var. *seyal*. The gum it produces is similar to that of var. *seyal*.

Acacia mellifera (Vahl) Benth. ssp. mellifera. Local names: Sampasa Gurach (Boran), Bassalor (Samburu) and Ebenyo (Turkana). This is a multi-stemmed shrub with purplish black branchlets and paired sharply recurved blackish prickles. The gum from this tree is clear and is usually chewed by local people. It is widely distributed in both divisions.

Acacia horrida (L.) willd. ssp. *benadirensis* (Chiov.) Hillcoat and Brenan. Local names: Chachanneh (Boran) and Aiyellel (Turkana)

Flat topped shrub that grows up to 5 m and branches from the base. It has a brownish bark, whitish spines, paired thorns that are sometimes very much enlarged. Pods are brownish and kidney shaped. It produces edible gum. Thus, only four of the Acacia species in the survey were identified as capable of producing gum. Out of these, *A. senegal* and *A. seyal* are known to produce gum that is used on a commercial scale. Three varieties of *A. senegal* are known to occur in the country (Brenan, 1983) though var. *senegal* was not encountered in the survey. It is the main variety that produces gum in Sudan. The study reveals that among the Acacias, all communities give same name to the gums as the species *Boswellia* species. Three species of *Boswellia* are said to occur in Kenya (Dale and Greenway, 1961). However, only one species was encountered in the survey.

Boswellia neglecta (S. More) Synonym: B. hildebrandtii (Engl.). Local names: Dakar (Boran), Ekinyate (Turkana).

It grows up to 8 m, has more branches, twisted bole and compound leaves, and red triangular pear shaped fruit. It is common on the red sandy loam soils around Garba Tula. The stem produces a merchantable incense (frankincense), olibanum, and gum. The smell of its burned wood is used to keep off insects.

Commiphora species.

There are 46 species of *Commiphora* indigenous to Kenya (Dale and Greenway, 1961). The resin producing species are listed below. It is important to note that the Borans name the resins depending on the mode of use while the Samburu and Turkana name them as is the case for Acacias as mentioned above.

Commiphora campestris (Engl.). Local names: Urgo (Boran)

Large, sprawling, spiny with angled and knobby stem, this bush has a yellowish green bark whose outside peels in small flakes leaving blue under bark. It yields quantities of consumable resin called 'Hampe' in Boran. This resin is commercially referred to as myrrh.

Commiphra confusa (Vollesen). Local name: Silchacho (Boran) and Ekadire (Turkana)

This is a spiny or sometimes less spiny shrub or tree that grows up to 5 m tall. It has a cylindrical trunk and yellowish or brownish peeling bark. Its pale yellowish-green trifoliate leaves gradually yellows with age. The flowers are yellow, appearing with the leaves in dense clusters. Fruit subglobose or ellipsoid, smooth. It got its name because of its confusing similarity with *C. africana*. Said to produce the most valuable incense in Isiolo. The resin which is used as incense is known as 'Lubathin' by the Boran.

Commiphora erythraea (Ehrenb.) Engl. Local name: Hagarsu (Boran), Sammonderi (Turkana).

This tree grows up to a height of 6 m. It has a well defined cylindrical trunk, spineless branches, trifoliate leaves, and white bark that peels in large papery rolls to expose blue-green under bark. It yields resin called 'Hura' in Boran (i.e poisonous

and medicinal), used as insect repellent and in treatment of foot rot in sheep. The bark yields a red dye called 'Fursa' that is used both as a preservative and decorative substance.

Commiphora incisa (Chiov.). Local name: Wara (Boran)

Spiny shrub 3-4 m tall with blackish grey bark peeling off in horizontal lines. Leaves toothed, in groups of 5 and turn yellow with age. Produces milky resin that turns sticky and is called 'Hancha' by Boran i.e it is chewed like a chewing gum.

Commiphora rostrata (Engl.). Local name: Dirraa (Boran), Itilimani (Samburu) and Lokimeta (Turkana)

Strongly scented shrub with grey smooth bark and spiny branches. When pierced a spray of clear resin resembling kerosene spurts out as though under pressure. The shrub is used as medicine for coughs and colds and sap is applied for eye disease. Leaves are salty and usually eaten by children while the branch is chewed like sugar cane. The use of indigenous knowledge is gaining widespread recognition (Barrow, 1991; Rist, 1991) in rural development. In the present study it was observed that local pastoral communities have good knowledge in distinguishing species to the level of varieties and could tell useful features for identifying the species or varieties in the rains (like leaves and flowers) and dry season (based on the nature of the bark and branches). such information could be useful in resolving some of the current taxonomic difficulties within the Burseraceae family.

Local uses of the products indicate potential commercial application. For example, gums commonly called 'Hura' used as local medicines have bioactive compounds and could be valuable in the pharmaceutical industry. Those known as 'Hancha' or 'Hampe' could easily find application in the cosmetic and food industries.

Reconnaissance survey

Vegetation units containing sufficient quantities of gum and resin species in the two divisions are shown in Figure 1. These units occur in three ecological land units: basement hills and pediments, basement ridges and basement peneplains (EMI/ODA, 1990). Four of the units (4B, 4BS, 5B AND 5WBS) are found in central division.

The occurrence of the species in the vegetation units by stands are shown in Table I. *A. senegal* is the most widely distributed species represented in more than 75% of the stands. Two varieties were distinguished with var. *kerensis* being more predominant and main source of gum arabic while var. leiorhachis also said to produce gum was observed in Malkadaka region of Garba Tula division. *C. erythrea* and *C. confusa* were also abundant being represented in more than 50% of the stands. These results confirm earlier studies (Agnew and Waterman, 1989) who had observed Boswellia neglecta as also prominent. Although *A. seyal* and *C. rostrata* occur in both divisions, they were less abundant and had a restricted distribution with the former restricted to areas with impeded drainage. *C. incisa* and *C. campestris* were confined to two units in Garba Tula. On the overall, the latter division had a higher representation of the resin producing species. The information gathered provide a good basis for ecological studies to determine ecological preferences for the species and more importantly plan for mapping out production areas.

SUMMARY

Ethnobotanical and reconnaissance surveys were undertaken to provide baseline information needed for subsequent development of gums and resins using Isiolo District as a pilot area. Four species of Acacia, one of *Boswellia* and five of *Commiphora* were identified as sources of gums and resins in the district. *A. senegal, C. confusa* and *C. erythrea* are abundant and widely distributed in the district while the other species were confined in some areas or have a restricted distribution. The local communities had useful knowledge in the identification of these species and local uses of their products which could be incorporated into scientific information for rational economic development. The information thus gathered is valuable in planning for extensive studies into the management of the

resources for production of valuable products. Over 75% of Kenya is marginal, technically referred to as Arid and Semi Arid Lands (ASAL). It is characterised by low biological productivity resulting from scant and erratic rainfall, intense radiation, strong dry winds and poor soils. It is within this region that Isiolo District falls. Mean annual rainfall for the area varies from 100 mm in the drier north to slightly over 600 mm in the south. Temperatures are high throughout the year with a mean of 270C. Soils are mostly sandy with patches of red soils while black cotton soils are found along perennial rivers and swampy areas. These conditions support drought deciduous *A. commiphora* bushland (Agnew and Waterman, 1989). The grass cover depends on the density of woody vegetation and is available mostly during the dry season.

The harsh and uncertain environmental conditions have made nomadic pastoralism the most viable mode of production in the district. The main ethnic groups are Boran who make 50% of the population, Somali (19%), Turkana (11%), Samburu (9%) and Meru (8%). Apart from the Meru, others are nomads whose economic mainstay is pastoralism (Ministry of planning, 1989). Vegetation is thus an important component to these communities for the provision of grazing and browse resources. In addition, it is a source of fuelwood, fencing and building material as well as for local medicines. The government and several non-governmental organisations recognize this importance and have initiated a number of projects in the area on the management of range resources to support the livelihood of local pastoral communities and stimulate livestock production.

However, livestock production is just but one source of livelihood that the range lands of Isiolo support. The vegetation has in addition an enormous wealth of hidden treasure. Most of the woody resources (trees and shrubs) hold known or potential promise as producers of economically viable products. For instance gum arabic produced by *A. senegal* is an important article of commerce with various uses in the food industry (Robbins, 1987). Currently Sudan is the leading producer accounting for about 80% of world production. Gum talha, a gum of lesser value is produced by *A. seyal* and has wide application in the non-food industries (Anderson, 1989). Species in the Burseraceae family are known to produce chemical products used in the pharmaceutical, cosmetic and food industries (Tucker, 1986). Myrrh and frankincense are the most important products from *Commiphora* and *Boswellia* species and until recently, Somalia was the world's leading producer (Ali, 1986).

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The present study reports work carried out between 1989 and 1991 to provide baseline information on the existing potential of Isiolo district in gum and resin resources for subsequent development. It was initiated following a consultative meeting of interested groups in Nairobi chaired by Ford Foundation. Preliminary investigations had indicated that local people have useful knowledge about various plant resources and ethnobotanical studies were considered desirable as part of the initial data base. Reconnaissance survey was also recognised as important in laying the frame work for detailed ecological and inventory surveys and eventual planning for production.

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