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THE USEFUL SEED PLANTS
AND PLANT PRODUCTS OF KENYA

by

Elizabeth A. Muthiani

A Thesis
Submitted to the
Faculty of the Graduate College
in partial fulfillment
of the
Degree of Master of Arts

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Elizabeth A. Muthiani

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CHAPTER I

INTRODUCTION AND GEOGRAPHICAL BACKGROUND

Economic botany is a broad discipline that encompasses all phases of man's relationship to plants. For example, a single species could be studied with respect to: its historical uses, its present uses, multiple uses of its parts and products, its geographical distribution, its cultural significance to certain peoples, marketing of its products, and its domestication. Alternatively, a geographical region could be studied with respect to all of the useful plants in that region.

The purpose of this study is to condense the available information pertaining to the useful seed plants and plant products of Kenya. For this study, a useful plant is defined as one which contributes to the economy of Kenya by having parts or products which are being: (1) exported, (2) sold on the East African market, (3) used locally, or (4) researched for possible future value. For each useful plant, information was gathered regarding: (1) its names, (2) its geography, (3) its source of introduction, and (4) the relative economic importance of its parts and products. These species were then arranged alphabetically into a reference compendium.

The emphasis is on the use of plant parts and products. Therefore, from the reference compendium, a series of tables was constructed in which plants were grouped according to usage. For example, all plants having wood or wood products were grouped into Table 1, plants yielding tannins into Table 2, etc. These tables are included at the end of the respective sections of the discussion. The appendix contains a directory of herbaria and botanical gardens where dried or live specimens of economic plants of Kenya may be further studied.

An important consideration in discussing the economic botany of Kenya is the geography of the country. Kenya, bisected by the equator, has great extremes of rainfall, altitude, and temperature, giving it a variety of representative climates. The country may be divided into five geographical divisions: (1) the Lake Victoria Basin, (2) the Central Rift and Associated Highlands, (3) the Eastern Plateau Foreland, (4) the Coast, and (5a/b) the Semi-arid and Arid Northern and Southern Kenya.¹

The Lake Victoria Basin (1), generally tropical, is roughly 3700 feet above sea level. It has an average temperature of 70 degrees F. and a mean annual rainfall, varying according to location, from 40 inches to over 70

¹See Map 1, p. 7

inches (Barclays, 1966, p. 3). Usually, there is no dry season, that is, rainfall is evenly distributed throughout the year. The soils vary from sandy loams of medium quality to reddish-brown earth of volcanic origin, of good quality (Pritchard, 1963, pp. 115-29). This division which roughly corresponds to Nyanza Province² exports coffee, cotton, groundnuts, pyrethrum, tea, and tobacco.

The Central Rift and Associated Highlands (2), have in general, a temperate climate (Barclays, 1966, p. 3). Altitude varies from 3000 feet on the floor of the Rift and on the extreme east and west boundaries of the Rift, to 8000 feet in the highland plateaus. Included are several mountain ranges rising as high as 17,000 feet (Pritchard, 1963, p. 18). Temperature varies from 60-80 degrees F. There are two rainy seasons, the "long rains" from March to June, and the "short rains" from October to December. Rainfall averages about 40 inches annually but is 60 inches or more in sections of the highlands. Soils, generally of volcanic origin, are rich and deep throughout except for a wide zone around Nairobi which have poor quality (Pritchard, 1963, pp. 93-106). This division, which roughly corresponds to Rift Valley and Central Provinces, exports aloe, buckwheat, cedar,

²See Map 2, p. 8

cedarwood oil, coffee, ebony, geranium oil, muhuhu, oats, papain, passion fruit, pineapple, podo, pyrethrum, and sisal in varying amounts.

The Eastern Plateau Foreland (3), generally warm and dry, varies from 600 feet near the coast, to 3000 feet where it borders the highlands. One isolated mountain range, the Taita Hills in the southeastern corner of that division, rises to 7000 feet (Pritchard, 1963, pp. 86-92). The average temperature is 70-80 degrees F. and rainfall averages around 20 inches per annum (Barclays, 1966, p. 3; Pritchard, 1963, pp. 86-92). Soils are sandy loams, generally poor, with thin development. Southern Province and the western half of Coast Province including the Tana River along the northern border, and Taita Hills in the southeastern corner of Coast Province, comprise the major parts of this division. It exports African ebony, aloe, castor oil, coffee, cotton, passion fruit, pyrethrum, and sisal.

The Coast (4), comprising a narrow strip of land between sea level and 600 feet along the coast, is essentially humid tropical. The climate is hot with a mean shade temperature of 80 degrees F. but the heat is mitigated by the strong monsoon winds which blow from the south-east from April until November and from the north-east from January to March or April. The average rainfall is about 40 inches, with April and May as the

wettest months. The soils are mostly unfertile because they are composed of coral and sandstone (Pritchard, 1963, p. 17). The eastern half of Coast Province, that is, a narrow strip bordering the Indian Ocean makes up this division which exports African ebony, annatto, cashew, citrus oil, coffee, cotton, ebony, groundnuts, kapok, muhuhu, pyrethrum, sisal, and tobacco.

The Semi-arid and Arid Northern and Southern division (5a/b) consists of almost desert conditions. Altitude is moderate, ranging from 600-3000 feet and rainfall is very erratic; often it is less than 20 inches annually (Pritchard, 1963, pp. 86-92). Daytime temperatures are usually over 80 degrees F. and nighttime is cool (Pritchard, 1963, pp. 86-92). This division, comprising three-fifths of the whole of Kenya, includes Northern Province and a very dry section of Southern Province at the Rift Valley floor. Export items from this division are nonexistent except for a small amount of African ebony.

SUMMARY TABLE OF GEOGRAPHICAL DIVISIONS
AND THEIR CORRESPONDING EXPORT ITEMS¹

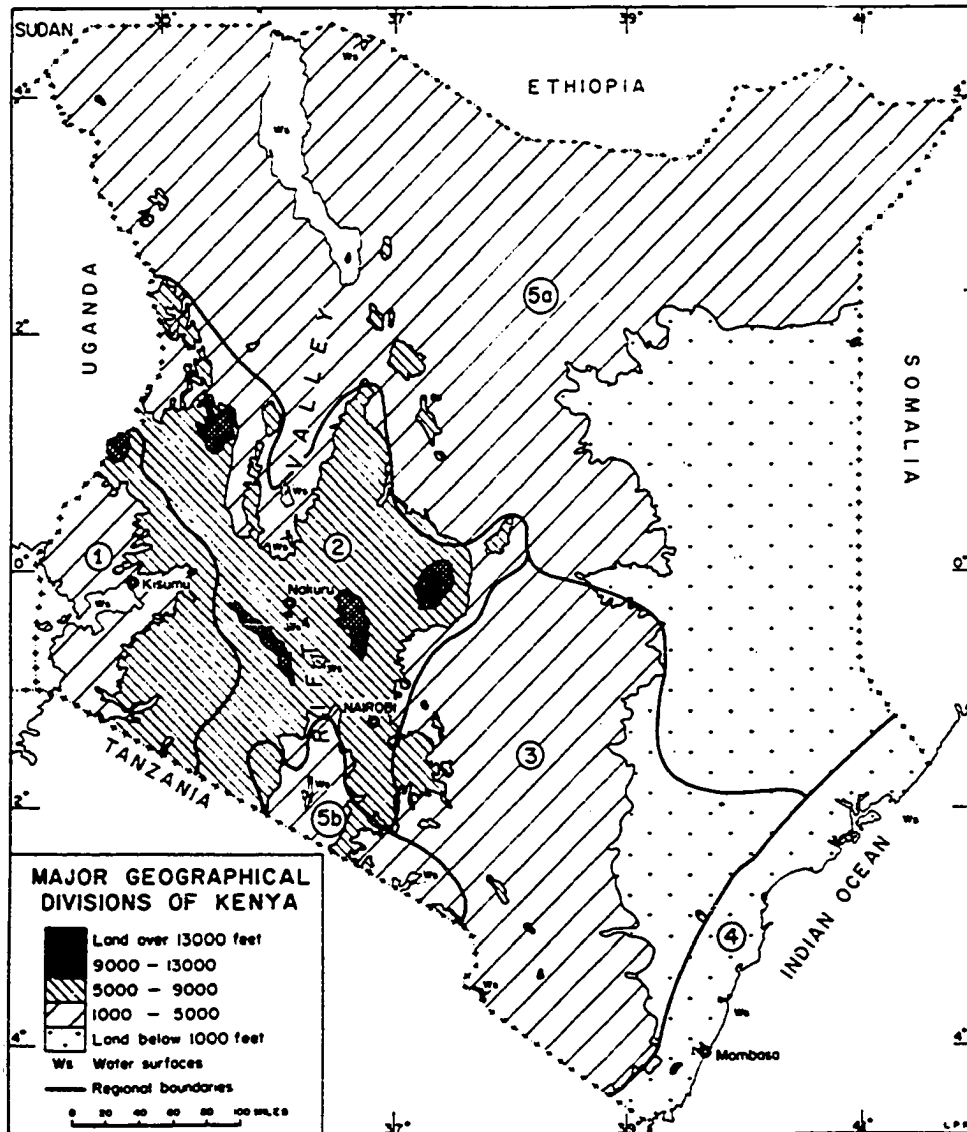
Divisions	1	2	3	4	5 a/b
Provinces included	Nyanza	Rift Valley Central	Southern Coast	Coast	North- ern South- ern
Climate	tropical humid	temperate varied	tropical dry	tropical humid	tropical desert
Temperature °F	70	60-80	70-80	80	80
Rainfall per annum	40-70 in. no dry season	40 in. two dry seasons	20 in.	40 in. no dry season	20 in.
Altitude in feet	3700	3000- 8000	600- 3000	0-600	600- 3000
Soils	medium to good	deep and rich	poor	poor	poor
Export Items	coffee cotton ground-nuts pyrethrum tea tobacco	aloe buckwheat cedar cedarwood oil coffee ebony geranium oil muhuhu oats papain passion fruit pineapple podo pyrethrum sisal	African ebony aloe castor oil coffee cotton passion fruit pyrethrum sisal	African ebony annatto cashew citrus coffee cotton ebony ground-nuts kapok muhuhu pyrethrum sisal tobacco	African ebony

¹ compiled by the author; numbers of divisions correspond to the regions shown on Map 1

MAP 1

MAJOR GEOGRAPHICAL DIVISIONS

- (1) The Lake Victoria Basin
- (2) The Central Rift and Associated Highlands
- (3) The Eastern Plateau Foreland
- (4) The Coast
- (5a/b) The Semi-arid and Arid Northern and Southern Kenya



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ADMINISTRATIVE BOUNDARIES 1961

The map illustrates the administrative divisions of Kenya. The provinces and their constituent districts are as follows:

- NORTHERN PROVINCE:** TURKANA DISTRICT, WEST POKOT DISTRICT, UASIN GISHU DISTRICT, ELGEYO-MARAKWET DISTRICT, NORTH RIFT VALLEY DISTRICT, CENTRAL RIFT VALLEY DISTRICT, NAROK DISTRICT, BARINGO DISTRICT, LAIKIPIA DISTRICT.
- CENTRAL PROVINCE:** NAROK DISTRICT, BARINGO DISTRICT, LAIKIPIA DISTRICT, Nyeri DISTRICT, Kiambu DISTRICT, Murang'a DISTRICT, Thika DISTRICT, Machakos DISTRICT, Makueni DISTRICT.
- EASTERN PROVINCE:** KITUI DISTRICT, TAITA DISTRICT, KILIFI DISTRICT, LAMU DISTRICT, MALINDI DISTRICT.
- SOUTHERN PROVINCE:** NAROK DISTRICT, BARINGO DISTRICT, LAIKIPIA DISTRICT, Nyeri DISTRICT, Kiambu DISTRICT, Murang'a DISTRICT, Thika DISTRICT, Machakos DISTRICT, Makueni DISTRICT.
- COAST PROVINCE:** KILIFI DISTRICT, LAMU DISTRICT, MALINDI DISTRICT.

The map also shows the Indian Ocean, the Equator, and an inset map of Africa.

Modified from Ominde, 1968, p. 13 with permission from
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CHAPTER II

DISCUSSION

Forests and Forest Products - Timber, Tannins, Latex, Gums, and Resins

Natural forests in Kenya cover 3.2 per cent of the land and of this only half is marketable timber (Barclays, 1966, p. 50). The forest areas are concentrated on the upper slopes of mountains in the highlands where trade winds are intercepted in such a way as to drop their moisture, and along the coast where rainfall is heaviest (O'Connor, 1966, p. 136).

The highland forests, mostly above 7500 feet, consist mainly of indigenous softwoods such as the African pencil cedar (Juniperus procera) and podo (Podocarpus gracilior and P. milanjanus), and plantations of fast growing softwoods of introduced species such as pine (Pinus radiata and P. sylvestris) and cypress (Cupressus lusitanica and C. macrocarpa) (Barclays, 1966, p. 18; Pereira, 1952, pp. 73-5; Pritchard, 1962, p. 41). Areas of these forests are found (1) in Rift Valley Province west of the valley and in Laikipia District east of the valley, (2) in Central Province on the slopes of the Aberdare Mountains, and (3) in Nyanza Province around Mount Elgon (O'Connor, 1966, pp. 135-6).

The African pencil cedar is made into lead pencils, wardrobe liners, flooring, roofing shingles, posts, and building poles. Its chief attributes are its resistance to termites and its durability in the ground. Because it has a characteristic "cedarlike" scent and is difficult to impregnate, it is used where its odor and natural oils are advantageous as is reflected in the uses listed above. In contrast, podo is white, clean colored, and easy to impregnate. This makes it an excellent wood for paneling, bakery boards, food cases, cupboards, and plywood. Also, its resistance to acids makes it a good candidate for battery separators (Dale and Greenway, 1961, pp. 3-5). Pine, generally not durable, is used for indoor carpentry such as flooring, cabinets, shelving, furniture, and plywood, and cypress, generally quite durable, is used for general construction work (Kaplan, et. al., 1965, p. 497; O'Connor, 1966, p. 139).

Most softwoods utilized in Kenya are supplied to small woodworking firms to be made into the products mentioned above and then are used internally or may be exported as unfinished timber. The market for East African softwoods is not very great in Europe, the usual importer of most East African materials, because closer supplies are available to European countries. New markets may be found in East Africa itself, but this may

take considerable time because on a local level, timber and its finished products must compete with other cheaper and more suitable materials ranging from dried mud and cow dung for construction to steel and aluminum for furniture. With increased industrialization, people of East Africa may demand more finished wood products and have the money to pay for them (O'Connor, 1966, pp. 135-9).

In addition to their value as timber, the highland forests are important in their role as regulators of rainfall thereby reducing erosion and insuring a steady water supply for land at lower altitudes (O'Connor, 1966, p. 134). It is important that forests cover the hill-sides either naturally or planted rather than the indigenous bamboo (Arundinaria alpina), because the forests do a better job of water regulation than does bamboo (Pereira, 1952, pp. 73-6).

In contrast to the highland softwoods, the coastal forests consist of valuable hardwoods such as ebony (Diospyros abyssinica) (Dale and Greenway, 1961, p. 172) and African ebony (Dalbergia melanoxylon) (Dale and Greenway, 1961, p. 362), and muhuhu (Brachylaena hutchinsii) (O'Connor, 1966, p. 136). The two ebonies are among the most valuable woods in East Africa because of their stability when exposed to extreme changes in climate. They are made into musical instruments, brush backs, walking sticks, small tools, and carvings. Ebony, from

Diospyros abyssinica because it is very heavy, is made into loom shuttles for weaving sisal cloth (Dale and Greenway, 1961, p. 172). Muhuhu, valuable because of its durability, is exported as floor blocks (Dale and Greenway, 1961, p. 362; O'Connor, 1966, p. 136).

To Kenyans, greater value is given to trees as sources of building poles and fuel than as timber. These two materials are often products of savanna woodland or scrub areas such as those found in the semi-dry areas of every province and mangrove swamps along the coast. A variety of indigenous species are used for building poles including Afzelia cuanzensis, Brachylaena hutchinsii, Bridelia micrantha, Catha edulis, Chlorophora excelsa, Markhamia platycalyx, Olea africana, O. welwitschii, and Rinorea poggei. The most popular building pole, however, is introduced eucalyptus (Eucalyptus globulus, E. saligna, and possibly other unidentified species), which is often planted around settlements where the local indigenous supply of building poles is low, because eucalyptus grows very rapidly compared to native species. It has also been planted in large tracts in some areas of Central Province as a plantation crop for timber and building poles. Mangroves from the coast supply a very durable kind of building pole because of the high tannin content of the wood. The most popular species from such areas are Ceriops candoliana, C. tagal, and Rhizophora

mucronata. Locally, Kenyans use the poles for supports in buildings which are finished with other durable materials such as bricks, concrete, or dried mud, and commercially for supporting telegraph and electric wires (O'Connor, 1966, pp. 139-41).

It has been estimated by a team of FAO¹ experts that East Africans use five times more wood for building poles than as timber, and an even greater amount is consumed for fuel. This team estimates that 1000 million cubic feet of fuelwood is used annually which is ten times the usage of timber (O'Connor, 1966, p. 140). In most areas the fuel is used in cooking, but in the highlands where the temperatures may at times drop to the forties in the evenings, fuelwood is also used for heating (Pritchard, 1966, p. 70). Fuel for domestic use is produced commercially mainly in the form of charcoal and also by Kenyans locally who make their own charcoal by partially burning scraps of wood in covered pits. Large quantities of locally made charcoal are brought in daily to the towns by van or bicycle from the surrounding countryside. Fuelwood is also used by some industries such as sugar factories, oil mills, tea factories, tobacco-curing factories, and fish drying factories especially where electricity supplies are unavailable and fuelwood supplies

¹FAO - Food and Agricultural Organization of the United Nations

are nearby (O'Connor, 1966, p. 141). Species used for fuel are Acacia mearnsii, A. senegal, Bridelia micrantha, Catha edulis, Ceriops tagal, Cynometra weberi, Olea africana, Phyllanthus discordeus, Piaggiaaea demartiniana, Rhizophora mucronata, Tamarindus indica, and introduced Eucalyptus (a variety of species). A specialized kind of fuelwood is muhuhu (Brachylaena hutchinsii) used for cremations because of its pleasant scent (Dale and Greenway, 1961, pp. 155-7).

Species used for timber, building poles, and fuel are summarized in Table 1.¹

An important observation on the nature of Kenyan forests is that most forests contain many intermixed species as seen by the extensive selection in Table 1. Although many of these species are useful, this large diversity is undesirable because a uniform supply of timber, building poles, and fuelwood cannot be guaranteed to the market. This is one of the major reasons why plantation crops are very popular with the forestry department. Fast growing introduced species such as cypress take only thirty years to mature whereas podo and other indigenous softwoods average 100 years for maturity. Because of this rapid growth, the introduced species are

¹Tables 1, 2 and 3, relating to forests and forest products are at the end of this section on pp. 19-27

more suitable than native species, and this is why they are chosen over native species (O'Connor, 1966, p. 135).

A second observation about Kenyan forests is their inaccessability with respect to places from which they can be exported to outside markets. Since most of the forests are on mountain slopes far inland, transportation costs lessen the export value of the timber (O'Connor, 1966, p. 135). Consequently, coastal forests, even though they are less in acreage, have greater export value possibilities because they are located close to the Indian Ocean where their products can be loaded for export (O'Connor, 1966, p. 136).

Tannins, summarized in Table 2, are the most valuable forest product of Kenya. Two tannins are especially important for export, namely, that derived from the bark of the Australian wattle (Acacia mearnsii) grown in Central Province, and that derived from the native coastal mangrove (Rhizophora mucronata) (Sykes and Simon, 1954, pp. 59-65). The leather products made from the tannins of these two species are very different from each other. The tannin extracted from wattle bark produces a solid, very firm, faintly pink leather used for shoe soles (Hill, 1952, p. 121), whereas the tannin extracted from mangrove bark is used for thick, red leather made into conveyer belts and for other industrial purposes (Schery, 1952, p. 237). Extract containing the tannins is exported either in solid

or powder form; in Kenya, the extract is used in preparing local products (Barclays, 1966, p. 18). A variety of other trees, both indigenous and introduced, have been included in Table 2 as possible future sources of tannin. Most of them, though used on a local level, are unsuitable for widescale production because of the low amount of tannin present in the extract versus other impurities, the low yield per acre, or the unsuitable color of the leather prepared with the extract compared to the two very suitable tannin sources already developed in Kenya. However, several of them may rise to export value in the future as cash crops if they can be cultivated and prepared for market better than Acacia mearnsii or Rhizophora mucronata, especially in areas of negligible value for other agricultural purposes. Already, much of the land previously used for Acacia mearnsii has been cleared for other more valuable crops and the search will continue for a new tannin to take its place on the export market (Sykes and Simon, 1954, pp. 59-65).

Apparently, no rubber plants are successfully cultivated in Kenya. Only one native species, Mascarenhasia elastica, is reported to exude a latex but it can be processed into only an inferior non-commercial rubber (Dale and Greenway, 1961, p. 47). It is unlikely that introduced rubber species will supply Kenya with its own latex either. Both the para rubber tree (Hevea brasiliensis),

which supplies most of the world's rubber, and guayule (Parthenium argentatum), which thrives in dry regions, have been tried as research crops in Kenya, but for some reason they were found to be unsuitable for economic exploitation in Kenya (Suttie, 1970, pp. 372-85). In the absence of a suitable supply of rubber, Kenya industries rely on retreading of imported tires and imported finished rubber articles (Kaplan, et. al., 1967, p. 497). A recent possibility is for new industries to develop which manufacture synthetic rubber. At least two of the fixed oils obtained from crops already successfully grown in Kenya may be used for production of synthetic. They are the oils from sesame seed (Sesamum indicum) and maize (Zea mays).

A number of Acacia species exude gums. However, none of these have become important as export crops. The gums of Acacia mearnsii, A. senegal, and A. seyal, have been used by Kenyans as medicines, and the gum of A. sieberiana as an adhesive (Watt and Breyer-Brandwijk, 1961, pp. 538-50; Dale and Greenway, 1961, p. 295). Resin from Trachylobium verrucosum, a native species which is commercially important elsewhere in East Africa, has been discarded as a research crop with no apparent reason. It may, however, be tried again with success at a future date. Locally, use is made of the resin from a native species, Warburgia -

ugandensis, for fixing handles to tools (Dale and Greenway, 1961, p. 111).

Plants yielding latex, gums, and resins are summarized in Table 3.

TABLE 1. WOODS

PLANT NAME	CHARACTERISTICS OF WOOD	USE OF WOOD
<u>Acacia lahai</u>	red, very hard, durable, very heavy, 78 lb/cu ft air dry	pulley blocks fence posts bridge timbers rough farm buildings
<u>Acacia mearnsii</u>	durable, long fibered, burns well	paper mine timbers posts fuelwood railway ties
<u>Acacia senegal</u>	white, burns well	charcoal toolhandles (young root and stem)
<u>Adansonia digitata</u>	pale golden-yellow to dark brown, moderately hard and strong 42 lb/cu ft air dry, long fibered	cabinets blotting paper
<u>Afzelia cuanzensis</u>	light red, hard, 47-56 lb/cu ft air dry, durable in ground and resists shipworm	furniture doors dhows ¹ building poles
<u>Antiaria toxicaria</u>	white to yellow-white, soft and light, 23-34 lb/cu ft air dry, peels well	veneer

¹ dhow - single-masted ship used in the Red Sea and Indian Ocean (Guralink and Friend, 1962, p. 403)

<u>Aphania</u> <u>senegalensis</u>	gray-brown with dark veining, medium hard, durable if not exposed to weather	turnery cabinets interior carpentry
<u>Balanites</u> <u>aegyptiaca</u>	pale yellow-brown, resistant to insects, durable, heavy, 48-50 lb/cu ft air dry	toolhandles turnery
<u>Scrassus</u> <u>aethiopum</u>	hard and heavy, very resistant to termites	building pole
<u>Brachylaena</u> <u>hutchinsii</u>	pale yellow to pale brown with a characteristic storied structure, strong and heavy, 60-62 lb/cu ft air dry, extremely durable in ground and sea water	floor block building pole boats fuelwood for cremations
<u>Bridelia</u> <u>micrantha</u>	heartwood resistant to termites, burns well	building pole fuelwood charcoal
<u>Catha edulis</u>	pale golden-yellow to dark brown, moderately hard and strong, 42 lb/cu ft air dry, long fibered	cabinets blotting paper
<u>Ceriops</u> <u>candolliana</u>	strong and durable	building pole
<u>Ceriops tagal</u>	durable, burns well	boats building pole fuelwood
<u>Chlorophora</u> <u>excelsa</u>	heartwood brown, resistant to termites, fire, shipworm, and fungi	ships building pole
<u>Cupressus</u> <u>lusitanica</u>	durable	general construction work
<u>Cupressus</u> <u>macracarpa</u>	durable	general construction work
<u>Cynometra weberi</u>	burns well	fuelwood

<u>Dalbergia</u> <u>melanoxylon</u>	heartwood purple to brownish black, very hard and heavy, 82 lb/cu ft air dry, very durable, very resistant to climatic changes	fancy small articles especially musical instruments, walking sticks, and carvings brush backs
<u>Diospyros</u> <u>abyssinica</u>	strong and tough in bending, moderately heavy, 47-52 lb/cu ft air dry	loom shuttles for weaving sisal cloth fancy small articles inlay work toolhandles carvings
<u>Erythrophleum</u> <u>guineense</u>	heartwood extremely durable, very resistant to termites and borers, hard and heavy, 60 lb/cu ft air dry	construction work bridges door frames sleepers
<u>Eucalyptus</u> <u>globulus</u>	heartwood light yellow-brown, strong but only moderately durable	boats toolhandles posts fuelwood building poles
<u>Eucalyptus</u> <u>saligna</u>	heartwood tough and fairly durable, moderately heavy	construction work flooring boats sleepers fuelwood building poles
<u>Heritiera</u> <u>sp.</u>	durable	dhow masts
<u>Juniperus</u> <u>procera</u>	heartwood extremely resistant to termites, very durable in the ground, light to medium heavy, 32-38 lb/cu ft air dry, difficult to impregnate, distinctive "cedarlike" scent	pencils wardrobe liners flooring roofing shingles posts building poles

<u>Manilkara</u> <u>sansiborensis</u>	great resistance to wear and tear, durable in water	flooring mallets dhow construction work that will be submerged in water
<u>Markhamia</u> <u>platycalyx</u>	pale yellow-brown, resistant to decay	building pole
<u>Millettia dura</u>	tough	toolhandles
<u>Morus lactea</u>	heartwood brown, hard, durable in ground and fresh water, moderately heavy, 43-50 lb/cu ft air dry	cabinets flooring fancy articles
<u>Ocotea</u> <u>usamborensis</u>	yellow-brown, strong, moderately heavy, 32-40 lb/cu ft air dry, highly resistant to fungi and ants but not to termites	furniture
<u>Olea africana</u>	very hard, strong, and durable, heavy, 70-74 lb/cu ft air dry, burns well, extremely durable in ground	cabinets furniture paneling turnery building pole fuelwood
<u>Olea welwitschii</u>	heartwood yellow-brown to pale red-brown with dark streaks, heavy 49-52 lb/cu ft air dry, very strong, moderately durable, resistant to termites	building poles
<u>Phyllanthus</u> <u>discordeus</u>	brown to pale red, hard and heavy, burns well	cabinets fuelwood
<u>Piaggiaea</u> <u>demartiniana</u>	very hard	shoes fuelwood (branches)
<u>Pinus radiata</u>	white with a pinkish tinge, low resistance to decay and termites	flooring cabinets furniture

<u>Pinus radiata</u> continued		plywood shelving matches
<u>Pinus sylvestris</u>	soft, not strong, durable	furniture general carpentry
<u>Podocarpus</u> <u>gracilior</u>	creamy white to pale brown, clean colored, easily impregnated, odorless and taste- less, soft and light, 31 lb/cu ft air dry, resistant to acids	paneling bakery boards food cases cupboards battery separators plywood
<u>Podocarpus</u> <u>milanjianus</u>	same as <u>P. gracilior</u> except wood is slightly darker	same as <u>P.</u> <u>gracilior</u>
<u>Polyscias</u> <u>kikuyensis</u>	white, odorless, soft and light, 22-26 lb/cu ft air dry	boxes
<u>Populus</u> <u>ilicifolia</u>	dark brown, seasons well, light, 25 lb/cu ft air dry	dugout canoes
<u>Premna</u> <u>angolensis</u>	yellow-brown, sweet scented, moderately heavy, 48 lb/cu air	furniture carvings
<u>Pterocarpus</u> <u>angolensis</u>	red, very hard, easy to work	plywood furniture motars drums canoes spears
<u>Pygeum</u> <u>africanum</u>	heartwood pale red, not durable in ground, moderately strong and heavy, 45-58 lb/cu ft air dry	heavy con- struction strong furni- ture window and door frames
<u>Rhizophora</u> <u>mucronata</u>	very durable	building pole

<u>Rinorea</u> <u>poggei</u>	durable	building pole walking stick knobkerries ¹
<u>Spirostachys</u> <u>africana</u>	brown with handsome dark markings, very fragrant	fancy small articles
<u>Tamarindus</u> <u>indica</u>	burns well	charcoal
<u>Thespesia</u> <u>danis</u>	red, hard and durable	bows
<u>Thespesia</u> <u>populnea</u>	durable in ground and water	boats cabinets
<u>Trachylobium</u> <u>verrucosum</u>	heartwood pale to dark red-brown with a marked striped figure hard and heavy, 50- 60 lb/cu ft air dry, not durable in ground but resistant to marine borers	door and door frames

¹ knobkerrie - short club with a knobbed end used by some African tribes as a throwing and striking weapon (Guralink and Friend, 1962, p. 808)

TABLE 2. TANNINS

PLANT NAME	PLANT PART USED	PER CENT ¹ TANNIN
<u>Acacia albida</u>	bark	29%
<u>Acacia arabica</u>	pod	30%
<u>Acacia mearnsii</u>	bark	40%
<u>Acacia seyal</u>	bark	20%
<u>Avicennia marina</u>	bark and leaf	6%
<u>Barringtonia racemosa</u>	bark	18%
<u>Caesalpinia coriaria</u>	pod	40-50%
<u>Caesalpinia spinosa</u>	fruit	not available
<u>Ceriops candolliana</u>	bark	not available
<u>Ceriops tagal</u>	bark	24-42%
<u>Erythrophleum guineense</u>	bark	not available
<u>Eucalyptus astringens</u>	bark	40%
<u>Eucalyptus redunca</u>	bark and wood	19%

¹Taken from references for these species where they are entered in the Reference Compendium

<u>Eucalyptus</u> <u>sideroxylon</u>	bark	30%
<u>Heritiera</u> <u>spp.</u>	bark	14-15%
<u>Parkia</u> <u>filicoidea</u>	bark	14%
<u>Piliostigma</u> <u>thonningii</u>	bark and root	18%
<u>Pinus</u> <u>patula</u>	bark	16%
<u>Pinus</u> <u>radiata</u>	bark	16%
<u>Rhizophora</u> <u>mucronata</u>	bark	30-40%
<u>Sonneratia</u> <u>sp.</u>	bark	15%
<u>Terminalia</u> <u>chebula</u>	fruit	20%

TABLE 3. LATEX, GUMS, AND RESINS

PLANT NAME	STEM EXUDATE USED	USE OF EXUDATE
<u>Acacia mearnsii</u>	gum	medicine
<u>Acacia senegal</u>	gum	medicine
<u>Acacia seyal</u>	gum	medicine edible products such as con- fections
<u>Acacia sieberiana</u>	gum	adhesive
<u>Boswellia hilderbrandtii</u>	gum	incense
<u>Mascarenhasia elastica</u>	latex	inferior kind of rubber
<u>Trachylobium verrucosum</u>	resin (copal)	incorporated into high grade varnish
<u>Warburgia ugandensis</u>	resin	fixing handles to tools

Fibers and Textiles

Fibers and flosses are obtained in Kenya from over 250 species (Greenway, 1950, pp. 146-53). The most important of these for export is sisal from the leaves of Agave sisalana which was introduced into East Africa from Mexico via Florida in the 1890's (O'Connor, 1966, p. 89). This crop is excellent for Kenya as an export crop because it will grow in a variety of soils, even the poorer ones, and it needs only a moderate amount of rainfall. Although it grows best from sea level to 2000 feet, it will grow at altitudes of up to 6000 feet (Lerche, 1959, pp. 163-4). Most of the sisal planted in Kenya is on plantations in Coast Province, in Central Province around Thika, and in the dry parts of Rift Valley Province. It is not usually planted in the highlands because there is a better return for other crops there. Plantations are usually 4000 acres or larger because the fiber is only 4 per cent of the leaf which makes it necessary to have the factory on location for fiber removal rather than shipping the whole leaves over long distance by small growers (O'Connor, 1966, pp. 89-94).

The most important uses of sisal fiber are for baling and binder twine, ropes, bags, carpets, and upholstery padding. Although much of the fiber is still exported as

raw material, Kenya now produces some finished products both for home consumption and export (East African Trade and Industry, 1960, p. 55). Also, several important by-products have been developed from fiber wastes, namely, hecogenin, a precursor to the drug cortisone (Edwards, 1953, pp. 21-3), and a wax (Schery, 1952, p. 336).

A second important export fiber introduced into Kenya is cotton (Gossypium hirsutum). Unlike sisal, it is a valuable small farm crop. It does not lose much value per pound if it is hauled to the market before ginning; also, harvesting by hand is not much more costly than mechanical harvesting (O'Connor, 1966, p. 82). Cotton is more specific in its growth requirements than sisal. It requires more reliable rainfall and will not grow above 4000 feet. Areas suitable for its growth are Coast and Nyanza Provinces (Empire Cotton Growing Corporation, 1959, pp. 158-9).

Cotton-products derived from the lint on the surface of the seed are cloth, thread, strong, fishing lines, canvas, lace, gauze, toweling (grade A) and upholstery, cushions, mattresses, and absorbent cotton wool (grade B). From the linters are made mattresses, upholstery, and alpha cellulose which is used to make rayon, explosives, X-ray photographic film, shatterproof glass, and plastics. From the seed is pressed one of the world's most important semi-drying oils and a presscake which is made into cattle

feed or fertilizer (Empire Cotton Growing Corporation, 1959, pp. 158-9).

A third important fiber grown in Kenya is kapok obtained from the native Bombax rhodognaphalon and introduced Ceiba pentandra. B. rhodognaphalon thrives in dry bush of Northern, Southern, and Coast Provinces yielding kapok for commercial use, whereas Ceiba pentandra is cultivated along the coast for kapok to be exported. The chief attributes of kapok which is derived from the fibers around the seeds, are its non-hygroscopic and non-absorbent consistency, its springy and resilient nature, and its lightness. It is used for stuffing cushions, pillows, and mattresses. The seeds are pressed for an edible fixed oil used for soap and food purposes (Hill, 1952, pp. 47-9; Savile, 1959, pp. 160-1).

The largest other sources of fiber used mostly for baskets and mats locally throughout the country are from palms and banana leaves. Kenya palms include the African fan palm (Borassus aethiopum), the coconut palm (Cocos nucifera), the doum palm (Hyphaene coriacea), the wild date palm (Phoenix reclinata), and the raffia palm (Raphia ruffia). Banana leaf fibers are used from both Musa and Ensete ventricosum. Of the above, only two have been introduced, e.g. the coconut palm by the Arabs, and Musa, the edible banana. In addition to the used from its leaves, the coconut palm is important economically to the

coastal area for the coir fibers obtained by retting the husks. Coir fibers are made into brushes, ropes, and cordage. The shells are made into charcoal and the trunks are used in building (Cobley, 1956, pp. 116-22). Other uses for the palms and the banana will be found in the discussions on oils, beverages, fruits, and domestic uses.

Fibers from castor bean (Ricinus communis) and sugar cane (Saccharum officinalis) important by-products of the castor oil and sugar industries are made into cardboard, wall boarding, newsprint, paper, and artificial silk.

Fiber plants are summarized in Table 4.

TABLE 4. FIBERS AND TEXTILES

PLANT NAME	PLANT PART USED	USE OF FIBER OR FIBROUS PART
<u>Acacia senegal</u>	surface root	local cordage well ropes fishing nets
<u>Agave sisalana</u>	leaf fiber	baling and binder twine ropes bags carpets upholstery padding
<u>Ananas comosus</u>	leaf fiber	cloth
<u>Bombax rhodognaphalon</u>	fiber surround- ing the seeds	stuffing for cushions
<u>Borassus aethiopum</u>	leaf	mats and baskets
<u>Ceiba pentandra</u>	fiber surround- ing the seeds	insulation life-saving apparatus sleeping bags stuffing material
<u>Cocos nucifera</u>	leaf outer husk of the nut (coir fibers)	baskets and mats brushes, ropes, and cordage
<u>Englerodaphne subcordata</u>	stem fibers (bast)	local cordage
<u>Ensete ventricosum</u>	leaf petiole leaf blade	local cordage thatch

<u>Gossypium</u> <u>hirsutum</u>	lint surround- ing the seeds	thread, fabrics, etc. mattresses and upholstery rayon, explosives, plastics, etc.
<u>Hibiscus</u> <u>tiliaceus</u>	stem fiber (bast)	local cordage
<u>Hyphaene</u> <u>coriacea</u>	leaf fiber leaf	baskets and mats thatch
<u>Lanea</u> <u>alata</u>	fiber on surface of root	heat insulation
<u>Lasiosiphon</u> <u>glaucus</u>	stem fiber (bast)	local cordage
<u>Musa</u> spp.	leaf fiber leaf	local cordage mulch
<u>Phoenix</u> <u>reclinata</u>	leaf	baskets and mats
<u>Phormium</u> <u>tenax</u>	leaf fiber	tow lines twine cordage
<u>Raphia</u> <u>ruffia</u>	leaf fiber	woven materials cordage
<u>Ricinus</u> <u>communis</u>	stem	cardboard wall boarding newsprint
<u>Saccharum</u> <u>officinalis</u>	fibrous part of stem after ex- traction of juice	paper fiberboards artificial silk
<u>Sida</u> <u>carpinifolia</u>	stem fiber (bast)	brooms
<u>Thespesia</u> <u>populnea</u>	stem fiber (bast)	local cordage
<u>Urena</u> <u>lobata</u>	stem fiber (bast)	ropes

Dyes

Although there are many plants native to Kenya whose parts contain dyes of various colors, it is difficult to find references indicating which indigenous people using them. References to historical use of coloring matter at least for the Kikuyu and Kamba, two large Bantu tribes, imply that ochre, ~~an~~ earthy, reddish-brown to yellow clay (Guralink and Friend, 1951, p. 1015) was the most popular item used for decorating the body (Middleton and Kershaw, 1965, pp. 53 and 79). In early history, most clothing for these people consisted of banana leaves (not dyed) and skins which may have been dyed by plant materials present along with the tannins. For example, tannin extract from the bark of the mangrove imparts a red color to the leather (Sykes and Simon, 1954, pp. 59-65). During the last century when cloth was introduced from the coast, clothing became either a white or blue cloth rubbed with ochre or fat, or a blanket (Middleton and Kershaw, 1965, pp. 53-79). Coastal fishermen make use of a black dye from the bark of a native species Phyllanthus floribundus to both preserve and darken their fishing nets (Dale and Greenway, 1961, p. 215).

Today in Kenya many products of cotton and sisal are dyed with aniline dyes. However there may be a new

development of native crafts in women's clubs with natural dyes for tourist interest.

One natural dye plant, annatto (Bixa orellana) has an interesting history. It was originally introduced from South America as a decorative backyard crop early in the century, and then in 1958 it was decided to exploit it commercially when the world market was good (Suttie, 1970, pp. 372-85). It thrives in Coast Province. The useful part of the annatto is the seeds which are covered with an edible pigmented layer used to give butter, margarine, and cheese a red-orange color. Plans are to increase the value of the crop by finding other areas in the country where it may be grown, local extraction of the dye from the seeds, and exploring for useful by-products (East African Trade and Industry, 1963, pp. 26-9).

Dye plants are summarized in Table 5.

TABLE 5. DYES

PLANT NAME	PLANT PART USED	COLOR OF DYE
<u>Adansonia</u> <u>digitata</u>	root	red
<u>Afzelia</u> <u>cuanzensis</u>	wood	yellow
<u>Bauhinia</u> <u>thonningii</u>	root pod and seed	red blue
<u>Bixa orellana</u>	pigmented layer covering seed	red-orange
<u>Bombax</u> <u>rhodognaphalon</u>	bark	red-brown
<u>Bosqueia</u> <u>phoberos</u>	sap	red
<u>Ceriops</u> <u>candolliana</u>	bark	red
<u>Erythrophleum</u> <u>guineense</u>	bark	red
<u>Euclea</u> <u>fruticosa</u>	root	black
<u>Lawsonia</u> <u>inermis</u>	leaf	red-orange
<u>Parkia</u> <u>fillicoidea</u>	bark	red-brown
<u>Phoenix</u> <u>reclinata</u>	root	brown
<u>Phyllanthus</u> <u>floribundus</u>	bark	black
<u>Piliostigma</u> <u>thonningii</u>	root pod and seed	red blue

Essential Oils, Fixed Oils and Waxes Uses as Non-edibles

Essential oils are distinguished from fixed oils by the fact that they volatilize in contact with air, may have a pleasant taste, and usually have a strong, aromatic odor. Such oils can be removed from plant tissue by distillation without breaking down chemically (Hill, 1952, p. 175). In contrast to essential oils, fixed oils are removed from the plant by pressing the part containing the oil. Fixed oils may be divided into three categories: (1) the drying oils, usually non-edible, commonly utilized in the paint and varnish industries, (2) the semi-drying oils, sometimes edible, used in soap making, candle making, and cooking, and (3) the nondrying oils, usually edible, used for soap and lubricants and especially for cooking (Hill, 1952, p. 192).

There are three essential oils of economic importance to Kenya, namely, (1) cedarwood oil distilled from the wood of the African pencil cedar (Juniperus procera), (2) geranium oil distilled from the foliage of several species of geranium (Pelargonium), and (3) citrus oil distilled from the rind of the orange (Citrus aurantium). Cedarwood oil is used for moth repellent, deoderant, and perfume (Hill, 1952, p. 190), and geranium and citrus oils are used for perfume only. Cedarwood and geranium oils

are products of the highlands and citrus is a product of the coast. Plans are to expand production of citrus and geranium oils especially for African farms because studies indicate there is a good European market for them (East African Trade and Industry, 1961, p. 21; East African Trade and Industry, 1963, pp. 26-9).

Essential oils are summarized in Table 6. Those used for medicines or flavorings are included again under their respective headings.

Plants used primarily for their fixed oils in Kenya are the groundnut (Arachis hypogaea), coconut (Cocos nucifera), sunflower (Helianthus annuus), castor bean (Ricinus communis), and sesame (Sesame indicum) all introduced except for the castor bean, which is a native species. As with other cash crops, they are regionally distributed because of their growth requirements. Groundnuts and sesame are best suited to climates of Nyanza and Coast Provinces, coconuts to Coast Province alone, and sunflowers and castor beans to marginal maize land at medium to high elevations (Savile and Wright, 1958, pp. 1-9). In addition to these, cashew (Anacardium occidentale), used primarily for its nuts, cotton (Gossypium hirsutum) used for its fiber, and kapok (Ceiba pentandra) for stuffing material, and maize (Zea mays) used for its food value as a staple cereal, are big contributors to the vegetable oil industries. The most common non-edible products of these fixed oils are

soap, lubricants, paints, and varnishes. Usually, the inferior grades of edible fixed oils are used in this way.

Waxes are obtained from the sisal and raffia palm as valuable by-products of their greater importance as fiber plants. The waxes are used in commercial preparations.

A number of plants yielding oils of the fixed variety and waxes are listed in Table 7 (non-edible uses to be discussed here) and Table 10 (edible uses to be discussed along with food plants). Some fixed oils are used medicinally and are included also in Table 8 with other medicinals and will be discussed along with them.

TABLE 6. ESSENTIAL OILS
(Note: Starred species are included in Table 8. Medicines, and flavorings are handled separately in Table 10. Edible Products)

PLANT NAME	PLANT PART USED	USE OF OIL
* <u>Artemesia</u> <u>kurramensis</u>	leaf and top	medicine
<u>Brachylaena</u> <u>hutchinsii</u>	wood	perfume and cremations
* <u>Gynandropsis</u> <u>gynandra</u>	leaf	medicine
<u>Juniperus</u> <u>procera</u>	wood shavings	moth repellent deodorant perfume
<u>Leptospermum</u> <u>citratum</u>	leaf	perfume
* <u>Matricaria</u> <u>chamomilla</u>	dried flowerhead	medicine
* <u>Ocotea</u> <u>usamborensis</u>	wood	perfume medicine
<u>Pelargonium</u> spp.	foliage	perfume
<u>Rosamarinus</u> <u>officinalis</u>	inflorescence	perfume
<u>Vetiveria</u> <u>zizanoides</u>	root	perfume

TABLE 7. FIXED OILS AND WAXES - NONEDIBLE USES
(Note: Starred species are also edible and therefore are included in Table 10. Edible Products also)

PLANT NAME	PLANT PART USED	PRODUCT	USE OF PRODUCT
<u>Agave</u> <u>sisalana</u>	leaf fiber waste	wax	polish lubricant protective coating
<u>Aleurites</u> <u>moluccana</u>	seed	drying oil	paints
* <u>Anacardium</u> <u>occidentale</u>	seed	nondrying oil	lubricant for brakes
* <u>Arachis</u> <u>hypogaea</u>	seed	nondrying oil	(inferior grade) soap lubricants illuminants
* <u>Ceiba</u> <u>pentandra</u>	seed	nondrying oil	(inferior grade) soap
* <u>Cocos</u> <u>nucifera</u>	endosperm	nondrying oil	(inferior grade) soap
* <u>Gossypium</u> <u>hirsutum</u>	seed	semi-drying oil	(inferior grade) soap
* <u>Helianthus</u> <u>annuus</u>	seed	semi-drying oil	(inferior grade) paint varnish soap
<u>Ricinus</u> <u>communis</u>	seed	nondrying oil	medicine protective coating

Ricinus
communis
 continued

insulation
 food con-
 tainers

drying oil
 (hydrated
 form)

lubricant
 paint
 varnish
 soap
 ink
 plastics
 illuminants
 leather
 preservative

*Sesamum
indicum

seed

semi-drying
 oil

(inferior
 grade)
 soap
 perfume
 rubber
 substitute

Telfairia
pedata

seed

nondrying
 oil

soap

Trichilia
emetica

seed

nondrying
 oil

soap and
 ointments

Zea mays

embryo of
 seed

semi-drying
 oil

soap
 paint
 rubber
 substitute

Medicines

Medicinal plants had been an integral part of the culture of East Africans long before the arrival of the Portuguese in the fifteenth century (Rodwell, 1969, pp. 18 and 31). In general, medicinal plants may be used by anyone who has the knowledge, although those who are most skilled practitioners are called medicine men. Most of the traditional cures are for alleviating discomforts of the digestive tract especially for worms or constipation, for respiratory ailments, for venereal disease, or for stimulation as seen in Table 8. Because these remedies are functionally sound, it is tempting to predict that they could be raised to commercial status in the future. This can happen, however, only if the crop can be successfully raised in sufficient quantity to warrant its distribution in the East African if not the world market. Usually, peculiar growth requirements of wild plants make it extremely difficult if not impossible to cultivate them in large quantities. For example, it is well known that the seeds of Strophanthus kombe, a native vine of Kenya, are valuable for their cortisone content. Cortisone is a cardiac stimulant in much demand on the world market. Presently, it is a research crop in Kenya; it may never go beyond that. The difficulty is that it is a vine which

requires extensive staking, making it a very expensive crop to cultivate on a large scale (Suttie, 1970, pp. 372-85).

If domestication of wild plants is not fruitful, what then is promising for new plant-derived medicines from Kenya? There are four possibilities for this: (1) exploitation of plants which have been successfully grown in Kenya for other purposes, (2) development of by-products from plants which are commercially important for other products, (3) development of medicinal uses from other commercially important products, and (4) synthesis of the active principle present in materials derived from highly successful traditional remedies. These four approaches are practical as is revealed by the following examples.

Aloe perryi native to the Mediterranean area has been cultivated in Kenya as an ornamental for centuries. When it was discovered that the juice of the leaves could be used as a laxative or for treating burns, it became an export crop. The fiber wastes of sisal (Agave sisalana) contain hecogenin, the starting material for synthetically prepared cortisone, the substance mentioned as valuable from Strophanthus seeds, but in this case available as a by-product of an existing export crop (Edwards, 1953, pp. 21-3). Castor oil from the seeds of Ricinus communis used as a nondrying oil or in its hydrated form as a drying oil is a valuable laxative (Hill, 1952, p. 200), and papain from the unripe fruits of the papaya (Carica papaya) which

is made into meat tenderizer can also be used to treat boils, skin conditions, respiratory ailments, and dissolve membranes from diphtheria (Lucas, 1966, p. 124). Many of the possible active principles present in traditional cures have been isolated at least in part as shown in Table 8. Further research may make their biochemical synthesis a reality.

Traditional and commercial medicines are summarized in Table 8.

TABLE 8. MEDICINES

PLANT NAME	PLANT PART USED	MOST LIKELY ACTIVE PRINCIPLE	USE
<u>Abrus</u> <u>precatorius</u>	root	glycyrrhizin	snakebite remedy aphrodisiac
	seed	abrin, a protein toxin	remedy for venereal disease oral contra- ceptive
	leaf	not available	remedy for stomach complaints
<u>Acacia</u> <u>mearnsii</u>	stem exudate	gum	remedy for bronchial diseases and condi- tions of upper res- piratory tract antidote for alcohol or ammonia poisoning pharmaceutical uses
<u>Acacia</u> <u>senegal</u>	stem exudate	gum	ointment astringent for colds ophthalmia diarrhoea haemorrhage
<u>Acacia</u> <u>seyal</u>	stem exudate	gum	same as <u>A.</u> <u>senegal</u>

<u>Agave</u> <u>sisalana</u>	leaf fiber waste	hecogenin, a steroid	starting material for corti- sone, a cardiac stimulant
<u>Albizzia</u> <u>anthel-</u> <u>mintica</u>	bark	musennin, a noncrys- talline	anthelmin- tic against tapeworm aphrodisiac remedy for gonorrhoea laxative
<u>Aleurites</u> <u>moluccana</u>	bark	not available	astrigent
<u>Aloe</u> <u>perryi</u>	leaf juice	glycoside	laxative treatment for burns
<u>Antiaria</u> <u>toxicaria</u>	sap	antiarin-x and z, both glucosides	cardiac stimulant
<u>Artemisia</u> <u>kurramensis</u>	leaf and top	volatile oil containing saponin	anthelmintic against roundworms
<u>Balanites</u> <u>aegyptiaca</u>	bark	most likely saponin	anthelmintic remedy for syphilis
	fruit, kernel, root, and branches	most likely same sapo- nin as above	anthelmintic emetic laxative
<u>Bauhinia</u> <u>thonnongii</u>	root	not available	remedy for bronchitis
<u>Calotropis</u> <u>procera</u>	fruit pulp	likely to be several glycosides	abortifacient laxative anthelmintic against guinea worm
	trunk exudate (latex)	glycosides	remedy for syphilis

<u>Calotropis</u> <u>procera</u> continued			leprosy elephan- tiasis laxative
<u>Carica</u> <u>papaya</u>	exudate from unripe fruit (latex)	papain and other enzymes	draws boils to a head remedy for ulcerous skin conditions nasal spray dissolves mem- branes from diphtheria
<u>Cinchona</u> <u>sp.</u>	bark	quinine	remedy for malaria
<u>Dioscorea</u> <u>dumentorum</u>	tuber	dioscorine, an alkaloid	starting material for many drugs and hormones
<u>Embelia</u> <u>schimperi</u>	root and seed	embelin	anthelmintic
<u>Gynandropsis</u> <u>gynandra</u>	leaf	acrid, volatile oil	remedy for eye and ear ailments
<u>Hagenia</u> <u>abyssinica</u>	female inflor- escence	kosotoxin, a yellow amorphous substance	anthelmintic against tapeworm
<u>Jateorhiza</u> <u>palmata</u>	root	may be due to three ac- tive alka- loids or simply acts as a nonas- tringent bitter	remedy for dysentery and stomach ailments
<u>Luffa</u> <u>cylindrica</u>	root	likely a saponin	laxative
<u>Matricaria</u> <u>chamomilla</u>	dried flower head	thick, blue, volatile	tonic and stimulant

<u>Matricaria</u> <u>chamomilla</u> continued		oil contain- ing apigenine which has spasmolytic properties	
<u>Ocotea</u> <u>usambor-</u> <u>ensis</u>	inner bark	highly odorous volatile oil	chest rubbing oil
<u>Oldfieldia</u> <u>somalensis</u>	inner bark	not available	remedy for chest complaints
<u>Punica</u> <u>granatum</u>	fruit rind	possibly a tannin or triterpene	anthelmintic against tapeworm
	bark of stem and root	isopelletierine	anthelmintic
<u>Rapanea</u> <u>rhodo-</u> <u>dendroides</u>	fruit	substance with astringent properties	anthelmintic
* <u>Ricinus</u> <u>communis</u>	oil from seed	ricoleic acid, an unsatur- ated fatty acid	local appli- cation to rid of warts laxative
<u>Schizogygia</u> <u>coffaeoides</u>	root	not available	remedy for skin dis- eases when used with coconut oil
<u>Strophanthus</u> <u>kombe</u>	seed	strophantho- cide and cymorol	cardiac 'stimu- lant
<u>Tamarindus</u> <u>indica</u>	ripe fruit	tataric acid	laxative fever remedy
<u>Trema</u> <u>guineense</u>	leaf	not available	remedy for cough

Picicides, Arrow Poisons, and Insecticides

Fishermen of Kenya are the Luo people around Lake Victoria and the Swahili people along the coast. Of these it is the Swahili people who make the greatest use of picicides. Powdered bark of Barringtonia racemosa, the seed of Erythrophleum guineense, the seed, leaf, and bark of Mundulea serica, and the leaf from Tephrosia vogelii have been used as picicides. These are usually not used to kill, but rather to temporarily stupify the fish so that they can be easily maneuvered. Usually the fish are trapped in pools of water containing the picicide upstream. Then when the fish are needed, they are freshened in untreated waters. Fish may be temporarily stored in the treated waters as a means of perservation instead of refrigeration which is often lacking or they may be killed immediately and dried (Sumner, 1960, p. 117).

Historically, arrow poisons were used by the Dorobo people of the highland forests especially during the dry season when food supplies were low (Smit, 1970, pp. 47-58). The wood, leaf, and seed of Acokanthera longiflora, the sap of Antiaria toxicaria, and the seed of Strophanthus kombe have been used in this way.

Unlike picicides and arrow poisons, which are mostly of historical interest, the use of insecticides derived

from plant materials has been greatly developed in Kenya from both native and introduced species. By far, the most important insecticide has been from pyrethrum extracted from the flowerheads of Chrysanthemum cinerariifolium. Although most other cash crops were introduced before World War I, pyrethrum is a more recent crop. It was introduced from Europe only 40 years ago (Suttie, 1970, pp. 372-85). It is a good example of a temperate crop which is successfully raised in the highlands. Cool temperatures are needed for flowering and a dry season is necessary for picking the flowerheads (Kroll, 1959, pp. 161-3). Pyrethrin, the active insecticidal ingredient from the flowerheads is a powerful synergist with sesame oil, another cash crop of Kenya (Hill, 1947, pp. 140-53).

Two other crops, tobacco (Nicotiana tabacum) and castor bean (Ricinus communis) have an insecticidal property in their leaves which may someday be developed for commercial purposes. Both of these crops are already important commercial crops for other uses.

Picicides, arrow poisons, and insecticides are summarized in Table 9.

TABLE 9. PICICIDES, ARROW POISONS, AND INSECTICIDES

PLANT NAME	PLANT PART USED	USE
<u>Acokanthera</u> <u>longiflora</u>	wood, leaf, and seed	arrow poison
<u>Antiaria</u> <u>toxicaria</u>	sap	arrow poison
<u>Balanites</u> <u>aegyptiaca</u>	fruit pulp	toxic to cold- blooded animals only, hence used for treating water supplies
<u>Barringtonia</u> <u>racemosa</u>	powdered bark	picicide
<u>Chrysanthemum</u> <u>cinerariifolium</u>	flowerhead	insecticide
<u>Erythrophleum</u> <u>guineense</u>	seed	arrow poison or picicide
<u>Mundulea</u> <u>sericea</u>	bark and root seed, leaf, and bark	insecticide picicide
<u>Nicotiana</u> <u>tabacum</u>	smoke from leaf	insecticide
<u>Ricinus</u> <u>communis</u>	leaf	insecticide
<u>Sesamum</u> <u>indicum</u>	oil from seed	powerful synergist with pyrethrins
<u>Strophanthus</u> <u>kombe</u>	seed	arrow poison
<u>Tephrosia</u> <u>vogelii</u>	leaf	insecticide and picicide

Edible Products

Cereals

Bohannon (1964, pp. 133-9) divides Africa, on criteria of geography and dominant subsistence practices, into four overlapping zones: (1) areas where root crops form the staple food, (2) areas where bananas (plantain) form the staple food, (3) areas where grains form the staple food, and (4) areas where meat and milk form the staple food. Kenya falls mainly into the grain and meat and milk categories with some overlap into bananas near Lake Victoria; also root crops are often planted as insurance against famine throughout the country.

Traditionally Kenyans have had a very nutritious diet from their native cereals. The cereals most commonly planted were finger millet (Eleusine coracana), bulrush millet (Pennisetum typhoides), and sorghum (Sorghum bicolor), all excellent sources of vitamins and minerals and highly tolerant of adverse environmental conditions. The trend now, however, is to plant maize (Zea mays), wheat (Triticum aestivum), and rice (Oryza sativa) mainly because of larger yields and easier preparation in the home. Successful cultivation of these three cereals depends largely upon altitude and to a lesser extent, upon rainfall and temperature.

Maize is planted on half the cultivated land except at altitudes above 7000 feet where it does not ripen well and around Lake Victoria where the land is not well drained (Miracle, 1966, pp. 136-42). Wheat which requires the cool, temperate climate found in the highlands, thrives at altitudes of 6500 feet and above with yeilds comparable to those of Australia or Canada. Rice is most successfully grown below 5000 feet in areas of high temperature and ample rainfall such as that around Lake Victoria and low altitude, low rainfall areas such as the Tana River Valley where irrigation water is provided. Almost all of the maize, wheat, and rice is consumed in Kenya (Kaplan, et. al., 1967, p. 437).

Except for rice which is eaten whole, cereals were ground traditionally by hand with mortar and pestle or today are usually ground with hand-operated mills or bought already ground, to be made into a stiff porridge (ugali - Swahili) (Inter-Territorial Language Committee, 1963, p. 490). The porridge is then broken off with the fingers and dipped into a sauce prepared with meat or vegetables or both (Bohannan, 1964, pp. 133-9). Cereals prepared in this manner may be millet, sorghum, maize, wheat or buckwheat. Also, fresh maize may be roasted over a charcoal fire still wrapped in its husk. In addition to ugali, a kind of unleavened bread (chapati - Swahili) probably originally introduced by the Asians is made by

frying a batter, usually made of wheat flour, in oil. The resulting bread is then torn into strips and again eaten with a sauce prepared with meat or vegetables. A third kind of cereal product is similar to doughnuts. Mandazi - (Swahili) is made by deep frying dough of intermediate stiffness made from flour of millet or wheat. It is usually eaten alone rather than being dipped into a sauce.

In addition to the cereals used internally, oats (Avena sativa) and buckwheat (Fagopyrum esculentum) a pseudo-cereal are widely planted in the highlands for export (Savile, et. al., 1957, pp. 228-33).

Cereals are summarized in Table 10 Part A.

Starches, Sugars, and Bee Plants

In addition to cereals, there are several other rather important starches derived from underground roots, stems, or tubers and one fruit crop, plantain (Musa spp.) cultivated by Kenyans. These crops, except for the Irish potato which is a temperate crop brought by the Europeans only recently, have been in the country for centuries. They are valuable because although the yield is low, they are reliable in withstanding drought and other adverse climatic conditions and are reliable insurance against famine in most areas of the country where people are settled. Crops falling into this category are the coco yam (Colocasia

antiquorum), the diosogenin yam (Dioscorea dumentorum), the sweet potato (Ipomea batatas), and cassava (Manihot esculenta). The Irish potato (Solanum tuberosum) falls into a category of its own because although it is widely accepted as a food, it can hardly be described as a famine crop because of its high susceptibility to disease in Kenya. Starches from these sources are either cooked fresh or dried (except for the Irish potato) and later cooked and mashed to be eaten with meat or vegetable sauces (Bohannan, 1964, pp. 133-9).

Flowers from Ilex mitis and buckwheat (Fagopyrum esculentum) are said to yield good quality honey. Honey from African bees is of importance mostly on a local level but could conceivably be exploited on an export basis in the future.

Starches, sugars, and bee plants are summarized in Table 10 Part B.

Flavorings and Tenderizers

Flavorings are essential oils which are used to season foods. In Kenya, flavorings may be divided into two; the ones used for making food hot, namely, the fruits of pepper (Capsicum annum) and twigs of Warburgia ugandensis, and the ones used to flavor beer, namely, dead sea fruit (Calotropis procera) and the fruit of the sausage tree (Kigelia aethiopum). Kenyans tend to like their foods hot.

Because of a suitable climate for raising peppers it is also exported as a ground spice. It is interesting to note a possible reason for the use of the sausage fruits for flavoring native beer (pombe - Swahili). Hops, which are used elsewhere for flavoring beer are long-day plants which will not flower on the equator (Suttie, 1970, pp. 372-85). Perhaps in the future, the sausage fruits will be exploited commercially for flavoring commercial beers in Kenya.

Traditionally, Kenyans have made use of the leaves of papaya (Carica papaya) to tenderize meat while it is cooking. The tough meat would ordinarily be wrapped in the leaves while the cooking process is going on (Williamson, 1955, p. 31). Commercially, the unripe fruits are slashed for gathering latex which contains the tenderizing enzyme papain. The latex is then prepared for export as a meat tenderizer. Papain is also used as a medicine as mentioned previously.

Flavorings and Tenderizers are summarized in Table 10 Part C.

Edible Fixed Oils

Edible fixed oils, that is, those oils which are mostly of the nondrying or semi-drying type, form an important part of the diet of Kenyans. The most important ones in use are from groundnuts (Arachis hypogaea),

coconuts (Cocos nucifera), and sesame seed (Sesamum indicum). Cooking oils are also obtained from cotton and kapok seeds as useful by-products of the fiber industry.

In the traditional diet, oil is used in preparing sauce made with vegetables and meat to be eaten with ugali or is used in preparing chapati or mandazi.

Edible fixed oils are summarized in Table 10 Part D.

Vegetables, Fruits, and Nuts

As in most tropical countries, Kenyans usually buy fruits and vegetables fresh daily from the market. Fruits are eaten as they are while vegetables, especially greens, are cooked with meat in sauce. The exceptions are the dried legumes and nuts which provide a valuable protein source to the diet. Legumes are usually allowed to mature in the pod and are then stored as dried seeds until they are needed. They may be cooked along with other vegetables or cooked alone, and then mashed to be made into deep-fried cakes. The most widely used legumes are the pigeon pea (Cajanus cajan), chick pea (Cicer arietinum), hyacinth bean (Lablab niger), gram (Phaseolus aureus), butter bean (Phaseolus coccineus), kidney or common dried bean (Phaseolus vulgaris), and the cow pea (Vigna unguiculata). Like the starches, these crops have been widely cultivated since ancient times and could also be considered insurance against famine in most areas.

The most popular nut for local use is the groundnut (Arachis hypogaea). Besides being a very important oil source, the seeds may be crushed into a consistency not unlike peanut butter and then cooked either alone or with other vegetables as a sauce to be eaten with ugali. An important export nut crop is cashew (Anacardium occidentale) which is most successfully grown in Coast Province.

On a commercial basis, Kenyans may be able to develop an extensive overseas market for out of season fruits and vegetables. Already Kenya pineapples (Ananas comosus) from the highlands and Kenya passion fruit (Passiflora edulis) have competed favorably on world markets. Suttie (1970, pp. 372-85) lists 70 fruit and vegetable crops that have been successfully cultivated by amateur gardeners in the country and there is reason to believe that many of these could be successfully raised on an export basis provided there was careful planning on marketing, storage, and transport beforehand. The advantage that Kenya has is that it can offer both temperate and tropical fruits and vegetables to the world market. The only major problem may be too much diversification too soon (Ensoll, 1970, pp. 40 and 46).

The most common vegetables, fruits, and nuts are summarized in Table 10 Parts E, F, and G.

Beverages

Two of the most common beverage plants in the world yield major exports of Kenya. They are tea from the leaves of Camellia sinensis and coffee from the fruits of Coffea arabica, a highland species, and Coffea robusta, a lowland species.

Tea was introduced from Asia into East Africa in the early 1900's. It is cultivated on acid soil in areas of well distributed rainfall of about 60 inches per annum at altitudes of 6000-7000 feet on cleared forest land (Pritchard, 1963, p. 64). The bushes may be planted in open sun or may be shaded depending upon the locality. Usually it is cultivated on private estates of 1000 acres or more, but like cotton, it lends itself to small scale production and in recent years many African farmers have been able to supplement their income with tea. Fortunately, it has been found that freshly picked green tea leaves may be transported over considerable distances without deterioration, therefore the factories need not be on location (Darby, 1963, pp. 452-3). Once a farmer is established, which may take five to seven years, his tea bushes will yield for 50-100 years.

Arabian coffee, believed to have originated in the Abyssinian Highlands is usually planted at 4500-6000 feet, while robusta coffee, believed to be native to tropical

Africa, is usually planted below 4500 feet. Both require shading. Coffee requires a warm climate averaging 65-70 degrees F., and rainfall of 40-50 inches per annum with a dry period for harvest. Once established, which takes four or five years, coffee trees bear for 30 years.

On a local level, homemade beers and wines are at least as important as coffee and tea as beverages. Inland the common traditional drink is pombe - (Swahili), the native beer. It is produced by the spontaneous fermentation of millet, plantain, maize, or sorghum or sometimes honey. Rather than hops, the fruit of the sausage tree (Kigelia aethiopum), as mentioned earlier, is used to flavor the beer (Dale and Greenway, 1961, p. 60).

Along the coast a common drink is palm wine made by fermenting the sap of the African fan palm (Borassus aethiopum) and the gingerbread palm (Hyphaene coriacea), and the juice from the unopened flower spathe of the coconut palm (Cocos nucifera).

Beverage plants are summarized in Table 10 Part H.

TABLE 10. EDIBLE PRODUCTS

A. CEREALS

PLANT NAME	USE OF CEREAL ¹
<u>Avena sativa</u>	made into oatmeal or exported as whole grain
<u>Eleusine coracana</u>	ground into meal or flour
<u>Fagopyrum esculentum</u> (pseudocereal)	made into meal or flour
<u>Oryza sativa</u>	eaten as whole grain
<u>Pennisetum typhoides</u>	ground into meal or flour
<u>Sorghum bicolor</u>	ground into meal or flour
<u>Triticum aestivum</u>	ground into meal or flour
<u>Zea mays</u>	ground into meal or roasted whole as fresh ears

¹cereal - a term, used generally here to include the true cereals from the Gramineae and a pseudocereal from the Polygonaceae, meaning the small, seedlike fruit of the plant (Guralink and Friend, 1962, p. 239; Schery, 1952, p. 365)

B. STARCHES, SUGARS, AND BEE PLANTS

PLANT NAME	PLANT PART USED	USE OF PRODUCT
<u>Colocasia</u> <u>antiquorum</u>	tuber	starch food
<u>Dioscorea</u> <u>dumentorum</u>	tuber	starch food
<u>Encephalartos</u> <u>hildebrandtii</u>	nut-like kernel	starch food
	pith of stem	starch food made into gruel
<u>Fagopyrum</u> <u>esculentum</u>	flower	honey
<u>Ilex mitis</u>	flower	honey
<u>Ipomea</u> <u>batatas</u>	tuber	starch food
<u>Manihot</u> <u>esculenta</u>	root	starch food or tapioca
<u>Musa spp.</u>	fruit	starch food (plantain)
<u>Saccharum</u> <u>officinalis</u>	juice from cane	sugar or jaggery a local kind of sugar
<u>Solanum</u> <u>tuberosum</u>	tuber	starch food

C. FLAVORINGS AND TENDERIZERS

PLANT NAME	PLANT PART USED	USE
<u>Calotropis</u> <u>procera</u>	latex from trunk exudate	trypsin to curdle milk and ferment beer
<u>Capparis</u> <u>spinosa</u>	unopened flower bud	flavoring for pickles and relishes
<u>Capsicum</u> <u>annuum</u>	fruit	ground into cayenne pepper
<u>Carica</u> <u>papaya</u>	milky latex from unripe fruit	meat tenderizer
	leaf	meat tenderizer
<u>Citrus</u> <u>aurantium</u>	fruit	essential oil for flavoring
<u>Coriandrum</u> <u>sativum</u>	seed	ground as a constituent of curry powder
<u>Kigelia</u> <u>aethiopum</u>	fruit	flavoring for native beer
<u>Parkia</u> <u>fillicoides</u>	powdered seed	flavoring for native dishes and soups
<u>Warburgia</u> <u>ugandensis</u>	bark, leaf, and fruit	hot flavoring for curries

D. EDIBLE FIXED OILS

PLANT NAME	PLANT PART USED	USE OF OIL
<u>Anacardium</u> <u>occidentale</u>	fruit	cooking oil
<u>Arachis</u> <u>hypogaea</u>	seed	salad oil cooking oil margarine shortening
<u>Ceiba</u> <u>pentandra</u>	seed	cooking oil
<u>Cocos</u> <u>nucifera</u>	endosperm	margarine or shortening
<u>Gossypium</u> <u>hirsutum</u>	seed	salad oil cooking oil margarine shortening
<u>Helianthus</u> <u>annuus</u>	seed	margarine and shortening
<u>Sesamum</u> <u>indicum</u>	seed	cooking oil
<u>Zea mays</u>	embryo of seed	cooking oil margarine

E. VEGETABLES

PLANT NAME	PLANT PART USED
<u>Abrus precatorius</u>	leaf
<u>Allium cepa</u>	bulb
<u>Brassica oleracea</u>	leaf
<u>Cajanus cajan</u>	seed
<u>Cicer arietinum</u>	seed
<u>Cichorium intybus</u>	leaf
<u>Colocasia antiquorum</u>	leaf
<u>Cucurbita moschata</u>	gourdlike fruit
<u>Ensete ventricosum</u>	stalk of inflorescence
<u>Lablab niger</u>	seed
<u>Lycopersicum esculentum</u>	fruit
<u>Luffa cylindrica</u>	young fruit
<u>Phaseolus aureus</u>	seed
<u>Phaseolus coccineus</u>	seed
<u>Phaseolus mungo</u>	seed
<u>Phaseolus vulgaris</u>	seed
<u>Vigna unguiculata</u>	seed

F. FRUITS AND FRUIT JUICES

PLANT NAME	PLANT PART USED
<u>Adansonia digitata</u>	fruit as is or made into a drink
<u>Anacardium occidentale</u>	fleshy apple-like "fruit" (botanically the peduncle and disk) as is or used in preserves
<u>Ananas comosus</u>	fruit as is or made into a drink
<u>Artocarpus incisa</u>	fruit sliced, then boiled or fried
<u>Artocarpus integra</u>	fruit sliced and eaten cooked or raw
<u>Carica papaya</u>	fruit as is or made into juice
<u>Citrus aurantium</u>	fruit as is or made into juice
<u>Citrus nobilis</u>	fruit as is
<u>Dovyalis caffra</u>	fruit made into preserves or jam
<u>Durio zibethinus</u>	fruit as is
<u>Hyphaene coriacea</u>	fruit as is
<u>Mangifera indica</u>	fruit as is
<u>Musa spp.</u>	fruit as is (sweet varieties)
<u>Passiflora edulis</u>	fruit as is or made into juice
<u>Persea americana</u>	fruit as is

Psidium guajava

fruit as is

Punica granatum

fruit as is

Tamarindus indica

fruit made into a drink

Vanqueria edulis

fruit as is when overripe

G. NUTS

PLANT NAME	PLANT PART USED
<u>Anacardium occidentale</u>	distal, terminal portion of the cashew "apple" (botanically the fruit)
<u>Arachis hypogaea</u>	seed
<u>Artocarpus integra</u>	seed
<u>Cocos nucifera</u>	endosperm (flesh)
<u>Macadamia spp.</u>	seed
<u>Sesamum indicum</u>	seed
<u>Voandzeia subterranea</u>	seed (similar to groundnut)

H. BEVERAGES

PLANT NAME	PLANT PART USED	BEVERAGE
<u>Borassus</u> <u>aethiopicum</u>	sap	palm wine
<u>Camellia</u> <u>sinensis</u>	leaf	tea
<u>Cichorium</u> <u>intybus</u>	root	coffee substitute
<u>Cocos</u> <u>nucifera</u>	juice from unopened flower spathe	palm wine
<u>Coffea</u> <u>arabica</u>	fruit	coffee
<u>Coffea</u> <u>canephora</u>	fruit	coffee
<u>Eleusine</u> <u>coracana</u>	fruit (cereal)	beer
<u>Hordeum</u> <u>vulgare</u>	fruit (cereal)	beer
<u>Hyphaene</u> <u>coriacea</u>	sap	palm wine

Domestic Animal Feed, Fertilizer, Green Manures,
Cover Crops and Coffee Shade

As with other useful plants, the kinds of forage crops that are used in Kenya vary from locality to locality. For example, maize, oats, sorghum, and the millets are planted in the highlands whereas the leaves of Sonneratia are fed to animals on the coast.

Much of the cattle feed to be discussed here is in the form of useful by-products from the vegetable oil industries. Presscakes, the leftover material after extraction of fixed oils, that are edible, are made into cattle feed while those containing harmful materials are made into fertilizers. Examples of plants yielding edible presscakes are the groundnut (Arachis hypogaea), kapok (Ceiba pentandra), the coconut (Cocos nucifera), and cotton (Gossypium hirsutum) whereas presscakes from the candlenut tree (Aleurites moluccana), sesame (Sesamum indicum), and castor bean (Ricinus communis) are harmful to cattle and are therefore made into fertilizer. In addition, bran from rice (Oryza sativa) and wheat (Triticum aestivum) are also made into feed.

The majority of Kenyans especially those of Bantu origin, are traditionally an agricultural people. Ever since migrating into the country between the twelfth and seventeenth centuries, they have been farming the arable soils

which are located along the coast, in the highlands, and around Lake Victoria in large tracts and sporadically throughout the rest of the country in marginal areas along rivers and on the tops of high hills. The rest of the country is too dry for farming. Because of the delicate nature of soils in the arable regions, especially in marginal areas, Kenyans have had to practice soil conservation throughout history. For example, the Taita very skillfully farm steep hillsides near the coast where only a few hills are high enough to intercept moisture from the Indian Ocean, and the Kamba, after a recent drought, have successfully reclaimed their hills which border the edge of the highlands and the desert bush (Matheson, 1965, pp. 3-43). Two species of indigenous trees used to hold the soil in these areas are Dodonea viscosa and Tephrosia vogelii; also, herbaceous species such as Vetivera zizanoides and cow peas (Vigna unguiculata) are often used as cover crops.

Coffee shade trees are used by Kenyan farmers for both highland (Coffea arabica) and lowland (Coffea robusta) species of coffee. Popular species are Albizzia stipulata, Cordia abyssinica, Erythrina indica, and Milletia dura. Shade trees are necessary to avoid "hot and cold" disease, that is, shade trees are used mostly to maintain a fairly constant temperature around the trees which would otherwise vary greatly between day and night in the highlands (Hanger, 1959, pp. 153-5). Lowland coffee shade is needed to

avoid overexposure to drying winds rather than day and night temperature variations (Savile and Hanger, 1959, pp. 155-7).

Animal feed, fertilizer, green manure, cover crops, and coffee shade trees are summarized in Table 11.

TABLE 11. DOMESTIC ANIMAL FEED, FERTILIZER, GREEN MANURE,
COVER CROPS, AND COFFEE SHADE

PLANT NAME	PLANT PART USED	USE
<u>Acacia</u> <u>albida</u>	pod	feed
<u>Albizzia</u> <u>anthelmintica</u>	leaf	feed
<u>Albizzia</u> <u>stipulata</u>	entire plant	coffee shade
<u>Arachis</u> <u>hypogaea</u>	presscake from seed, straw	feed
<u>Cajanus</u> <u>cajon</u>	forage crop	feed
<u>Ceiba</u> <u>pentandra</u>	presscake from seed	feed
<u>Cocos nucifera</u>	presscake from endosperm	feed
<u>Cordia holstii</u>	entire plant	coffee shade
<u>Dodonaea</u> <u>viscosa</u>	entire plant	sand binder
<u>Eleusine</u> <u>coracana</u>	grain	feed
<u>Erythrina</u> <u>indica</u>	entire plant	coffee shade
<u>Gossypium</u> <u>hirsutum</u>	presscake from seed	feed and fertilizer
<u>Helianthus annuus</u>	presscake from seed	feed and fertilizer
<u>Hordeum vulgare</u>	grain	feed
<u>Millettia dura</u>	entire plant	coffee shade

<u>Oryza sativa</u>	bran from grain	feed
<u>Pennisetum typhoides</u>	stalk	feed
<u>Ricinus communis</u>	presscake from seed	fertilizer
<u>Saccharum officinale</u>	fibrous part of stem	feed
<u>Sesamum indicum</u>	presscake from seed	fertilizer
<u>Sonneratia sp.</u>	leaf	feed
<u>Sorghum bicolor</u>	grain	feed
<u>Tephrosia vogelii</u>	entire plant	green manure or cover crop
<u>Triticum aestivum</u>	straw	litter, bedding, or mulching
<u>Vetiveria zizanioides</u>	entire plant	feed and anti-erosion
<u>Vigna unquiculata</u>	entire plant	feed and anti-erosion
<u>Zea mays</u>	grain or entire plant as silage	feed

Masticatories, Fumitories, and Miscellaneous Domestic Uses

This miscellaneous category of plant usage is probably the most intimately connected to the culture of the Kenyans themselves of all categories discussed. It is composed of the "extras" provided by plants to the everyday life of the people.

Two popular products widely used by Kenyans for chewing are khat, a stimulant derived from the leaves of Catha edulis and betel derived from the leaves of Piper betel. It is interesting to notice that both are important enough to be classified as cash crops by Suttie (1970, pp. 372-85). Equally interesting is the fact that both are mild stimulants, perhaps of some utilitarian value in a land where historically there has often been regional drought and famine. In addition to those above, tobacco from the leaves Nicotiana tabacum is widely used for chewing and smoking.

Africans are known for having excellent teeth. Besides having a revulsion for sweets except for their natural form in honey or sugar cane, they have traditionally made use of the twigs of trees as teeth cleaners. Two species, Dobera loranthifolia and Salvadora persica, appropriately named the toothbrush tree, are used for this purpose.

Some other interesting uses of plant products are the fruit cases of the baobab (Adansonia digitata) for carrying water, the pods of Bauhinia thonningii as a soap substitute, and the fruits of Luffa cylindrica and Tamarindus indica for cleaning pots and pans.

Plants also contribute to recreation, that is, the seeds of Caesalpinia cristata are used for counters in games, the seeds of Abrus precatorius are used for ornamental beads, and children often make fibrous balls out of banana leaf fibers for playing soccer. Even the missionaries found something useful from plants in the seeds of the wild banana (Ensete ventricosum) which they used for rosary beads. Although this list is not inclusive it does illustrate how intimately plants are connected to the life of the people in a given geographical area.

Plants used as masticatories and fumitories are summarized in Table 12 and plants used for domestic purposes are summarized in Table 13.

TABLE 12. MASTICATORIES AND FUMITORIES

PLANT NAME	PLANT PART USED	USE
<u>Areca</u> <u>catechu</u>	seed (nut)	masticatory used along with <u>Piper betel</u>
<u>Catha</u> <u>edulis</u>	leaf and twig	masticatory
<u>Nicotiana</u> <u>tabacum</u>	leaf	smoking and chewing
<u>Piper</u> <u>betel</u>	leaf	masticatory

TABLE 13. MISCELLANEOUS DOMESTIC USES

PLANT NAME	PLANT PART USED	USE
<u>Abrus</u> <u>precatorius</u>	seed	ornamental beads (poison)
<u>Adansonia</u> <u>digitata</u>	fruit case	water dipper
<u>Bauhinia</u> <u>thonnongii</u>	pod	soap substitute
<u>Caesalpinia</u> <u>cristata</u>	seed	counters in games
<u>Dobera</u> <u>loranthifolia</u>	young branch	teeth cleaner
<u>Ensete</u> <u>ventricosum</u>	seed	rosary beads
	leaf fiber	fibrous balls for playing soccer
<u>Luffa</u> <u>cylindrica</u>	mature fruit	pot scourer or dishcloth
<u>Salvadora</u> <u>persica</u>	twig	teeth cleaner
<u>Tamarindus</u> <u>indica</u>	overripe fruit	cleaner for copper and brass

CHAPTER III

SUMMARY

One hundred and eighty nine useful seed plants of Kenya were compiled from the literature into a reference compendium from which a discussion was prepared based upon thirteen use categories.

As is shown in the compendium and discussion, products from native seed plants are well represented in the use categories, but similar products from superior introduced species have often surpassed them especially for commercial use and for export. For example, native cedar and various savanna hardwoods are being replaced by introduced eucalyptus, pine, and cypress for building poles and fuel, palm leaf fibers and bast fibers by sisal for baskets and cordage, and millet and sorghum by maize, wheat, and rice for cereal. Added to this are other introduced species with no native counterparts such as pyrethrum for insecticide, and tea and coffee for beverages which are cultivated as cash crops for export.

The need for more finished plant products and crops providing these products is increasing as Kenya moves into a cash economy based upon its agriculture. Work in economic botany condensing present knowledge as does this study, and future research should place emphasis on

(1) multiple uses of present crops; often valuable by-products are derived from waste materials, (2) alternative uses of plant products, perhaps leaning towards synthetics in situations where a particular product is not easily obtained directly from plants cultivated in the country, (3) new crops for areas of negligible agricultural development such as river valleys in dry sections of the country, and (4) better marketing and processing facilities.

This study could serve as a starting place for those interested in the economic botany of Kenya especially students, farmers, and researchers. For example, the reference compendium would be useful as a checklist of current knowledge on individual species as a take off point for a research project or for farmers considering a particular species for cultivation. The discussion would provide a brief resume of feasible alternatives within a given use category. For example, shortages in tannins may lead back to the table on alternate species for tannins, and rubber shortages may lead back to the suggestion that fixed oils may be utilized for synthetic rubber.

With limited funding, the paper could be made more valuable if (1) sketches or photographs would be included from the specimens in the herbaria or botanical gardens mentioned in the appendix or from field observations in

Kenya, (2) native Kenyans would be interviewed for more data on local usage especially in the areas of medicinals and local names, and (3) government documents would be used to assess the relative economic value of cash crops.

With more extensive funding, a system could be devised for adding new material concerning the plants. A card file system could be set up backed by a computer program for easy access to knowledge on each species including projected markets, growth requirements, yield per acre, cultural acceptability, labor force, etc., on a multi-disciplinary level. This information could be continuously updated and from time to time short papers could be published concerning the most desirable crops both for home consumption and export, and revised up-to-date versions of reflections on use categories.

Although the manuscript represents a modest beginning to an overall study, it is hoped by the author that it will be published in its present form, at least in part, at a future date.

REFERENCE COMPENDIUM OF PLANTS AND PLANT PRODUCTS

This compilation was used as a reference for the previous discussions and tables. In this alphabetical list of plants, each entry includes: (1) the scientific name, (2) the common English name(s) near the right hand margin, (3) the Swahili name(s) directly under the scientific name, (4) a brief description of the natural habitat in Kenya or its distribution as a cultivated plant,¹ (5) whether it is native or introduced and the geographical source of introduction when this is known, (6) the uses of the plant or parts of the plant by Kenyans, and (7) the relative economic importance of the plant or plant products.² The list is confined to the seed plants. The scientific genus and family names used follow A

¹All geographical locations follow the 1961 administrative boundaries as shown in Map 2 of Chapter I

²Export (E) - any plant or plant product which is cultivated or collected from wild sources for cash rather than consumption and is sold outside the country on the world market

Commercial (C) - any plant or plant product which is cultivated or collected from wild sources for consumption by Kenyans on a large enough scale to require marketing

Local (L) - any plant or plant product which is cultivated or collected from wild sources for regional use only, usually not entering the market and of not much importance to the cash economy

Research Crop (RC) - any plant or plant product which is being investigated for its potential use

Dictionary of the Flowering Plants and Ferns (Willis, 1966), whereas the species name and common English name(s) follow The Dictionary of Economic Plants (Uphof, 1968). Whenever a plant is not mentioned in their lists, the species used is found in the cited references below the respective entry. If a plant has more than one spelling¹ or a synonym,² the other name(s) are listed in parentheses directly under the scientific name. Swahili names are taken from a variety of references and no attempt is made to discover the most acceptable Swahili term; rather, all names found are listed.

¹Alternate spelling (alt. sp.)

²Synonym (syn.)

1. Abrus precatorius (Leguminosae) Indian liquorice
mtipitipi, mongaluchi

A climbing plant bearing small seeds (crab's eyes) that are bright red on one end and black on the other; grows naturally in wet areas of Coast, Eastern, Central, Rift Valley, and Nyanza Provinces

Uses:

1. seed - strung together as ornamental beads (L); contains abrin, a protein toxin which may be the active principle in its use as a remedy for venereal disease and as an oral contraceptive (L)
2. leaf - cooked as a green vegetable (L); remedy for stomach complaints (L)
3. root - contains glycyrrhizin, which may be the active principle in its use as a snakebite remedy and as an aphrodisiac (L)

Reference (Ref): Inter-Territorial Language Committee, 1963, p. 309; Uphof, 1968, p. 2; Verdcourt and Trump, 1969, pp. 79-80; Watt and Breyer-Brandwijk, 1962, p. 535; Williamson, 1955, p. 3

2. Acacia albida (Leguminosae)

A tree growing in Southern, Rift Valley, and Coast Provinces in dry areas where the water table is near the surface

Uses:

1. pod - cattle feed (L)
2. bark - tannin, 29% (L)

Ref: Dale and Greenway, 1961, p. 284; Uphof, 1968, p. 3; Watt and Breyer-Brandwijk, 1962, p. 538; Williamson, 1955, p. 11; Willis, 1966, p. 3

3. Acacia arabica (Leguminosae) babul
(syn. A. nilotica)
mtetewi, mjungu, mgunga, msemehi, munga

A tree growing in low rainfall areas of Coast, Rift Valley, Southern, and Northern Provinces

Use:

pod - tannin, 30% (L - widely used)

Ref: Dale and Greenway, 1961, p. 291; Dalziel, 1948, pp. 202-4; Hill, 1952, p. 507; Sykes and Simon, 1954, pp.

59-65; Uphof, 1968, p. 3; Willis, 1966, pp. 3-4

4. Acacia lahai (Leguminosae)

A flat-topped tree usually 50 feet tall, found in Rift Valley Province and Karicho District of Nyanza Province 6000-8000 feet

Use:

wood - red, very hard, durable, very heavy, 78 lb/cu ft air dry; used for pulley blocks, fence posts, bridge timbers, and rough farm buildings (C)

Ref: Dale and Greenway, 1961, p. 290; Willis, 1966, p. 3

5. Acacia mearnsii (Leguminosae) black wattle
(syn. A. decurrens) green wattle

Acacia mearnsii (Leguminosae) in Kikuyu areas, which
(syn. A. decurrens) southern and eastern thirds
of Central Province, at altitudes of 5500 feet and
above; indigenous to Australia; grows better than tea
or coffee at dry, high altitudes; can be harvested af-
ter eight years

Uses:

1. bark - tannin, 40%, gives a solid, very firm, faintly pink leather much used for shoe soles (E)
2. wood - durable, long fibered, burns well; used for paper, mine timbers, posts, fuelwood, and railway ties (C)
3. stem exudate - gum, used medicinally as a remedy for bronchial diseases and conditions of the upper respiratory tract (L); used medicinally as an antidote for alcohol or ammonia poisoning and is suitable for pharmaceutical purposes (C)

Ref: East African Trade and Industry, 1963, pp. 26-9; Hill, 1952, p. 121; O'Connor, 1966, pp. 103-4; Suttie, 1970, pp. 378-85; Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 5; Watt and Breyer-Brandwijk, 1962, p. 540; Willis, 1966, p. 4

6. Acacia senegal (Leguminosae) Sudan gum arabic
kikwata

A savanna or bush tree usually 25 feet tall; said to yield gum best when in an unhealthy state because of poor soil, lack of moisture, etc.

Uses:

1. stem exudate - gum, used for ointments, and as an astringent for colds, opthalmia, diarrhoea, and haemorrhage (C)
2. wood - white, burns well; used for charcoal and that of the young root and stem is used for toolhandles (L)
3. surface root - fibrous; used for local cordage, well ropes, and fishing nets (L)

Ref: Dale and Greenway, 1961, pp. 293-4; Hill, 1952, p. 151; Irvine, 1961, p. 328; Uphof, 1968, p. 6; Watt and Breyer-Brandwijk, 1962, p. 550; Willis, 1966, pp. 3-4

7. Acacia seyal (Leguminosae) white whistling thorn
mgunga white galled acacia

A tree found in Northern, Rift Valley, Central, Nyanza, and Southern Provinces

Uses:

1. bark - tannin, 20% (L)
2. stem exudate - gum, used medicinally as an ointment, and as an astringent for colds, opthalmia, diarrhoea, and haemorrhage, and for edible products such as confections (C)

Ref: Dale and Greenway, 1961, p. 294; Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 6; Watt and Breyer-Brandwijk, 1962, p. 550; Willis, 1966, pp. 3-4

8. Acacia sieberiana (Leguminosae)

A tree growing in Rift Valley, Nyanza, and Coast Provinces

Use:

stem exudate - gum used where adhesion is desirable (C)

Ref: Dale and Greenway, 1961, p. 295; Irvine, 1961, p. 328; Uphof, 1968, p. 6; Willis, 1966, pp. 3-4

9. Acokanthera longiflora (Apocynaceae)
msunguti

A tree growing in Taita District, Coast Province and Nairobi and Kiambu Districts, Central Province at 5000 feet

Use:

wood, leaf, and seed - arrow poison (L)

Ref: Dale and Greenway, 1961, pp. 43-4; Inter-Territorial Language Committee, 1963, p. 305; UNESCO, 1960, p. 80; Willis, 1966, p. 13

10. Adansonia digitata (Bombacaceae) baobab
mbuyu

A savanna tree of vast girth from the coast to 4000 feet

Uses:

1. wood- pale golden-yellow to dark brown, moderately hard and strong, 42 lb/cu ft air dry, long fibered; used for cabinets and blotting paper (C)
2. root - red dye (L)
3. fruit - eaten as is or made into a drink (L)
4. fruit case - water dippers (L)

Ref: Dale and Greenway, 1961, pp. 66-7; Hill, 1952, p. 231; Inter-Territorial Language Committee, 1963, p. 270; Uphof, 1968, pp. 11-2; Willis, 1966, p. 19

11. Afzelia cuanensis (Leguminosae) afzelia
mkumbakusi

A large, spreading timber tree, usually 80 feet tall, growing in Coast Province in mixed evergreen forests

Use:

wood - light red, hard, 47-56 lb/cu ft air dry, durable in ground and resists shipworm; used for furniture, doors, dhows, and likely for building poles (C)

Ref: Dale and Greenway, 1961, p. 96; Rendle, 1969, pp. 84-5; Willis, 1966, p. 29

12. Agave sisalana (Agavaceae) sisal

A perennial thriving on a warm humid climate, preferably from sea level to 2000 feet but will grow satisfactorily at altitudes up to 6000 feet; tolerates poor soils and rainfall which is inadequate for coffee; first harvest after 3-4 years; introduced from Mexico to Coast Province around Mombasa, Voi, and the Taita Hills, in Central Province and Southern Province, and also Rift Valley Province in dry areas; it

is extremely drought resistant

Uses:

1. leaf fiber - used for baling and binder twine, ropes, bags, carpets, and upholstery padding (E)
2. leaf fiber waste - contains hecogenin, a steroid which is a starting material for cortisone, a cardiac stimulant (C); contains a wax used for polish, lubricants, and as a protective coating (C)

Ref: East African Trade and Industry, 1960, p. 55; Edwards, 1953, pp. 21-3; Farming Correspondent, 1968, p. 34; Frank, 1957, pp. 165-7; Hill, 1952, p. 36; Kenya Government, 1965, (Map); Lerche, 1959, pp. 163-4; O'Connor, 1966, pp. 93-4; Schery, 1952, pp. 33-6; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 18; Watt and Breyer-Brandwijk, 1962, p. 20; Willis, 1966, p. 31

13. Albizzia anthelmintica (Leguminosae)
mporojo, mtikiti

A tree, widely spread in dry savanna except in Rift Valley and Nyanza Province

Uses:

1. bark - contains musennin, a noncrystalline saponin which may be the active principle in its use as an anthelmintic against tapeworm, an aphrodisiac, a remedy for gonorrhoea, and a laxative (L)
2. leaf - fed to domestic animals (L)

Ref: Dale and Greenway, 1961, p. 299; Uphof, 1968, p. 21; Williamson, 1955, p. 14; Watt and Breyer-Brandwijk, 1962, p. 554; Willis, 1966, p. 37

14. Albizzia stipulata (Leguminosae)

see Coffea canephora

15. Aleurites moluccana (Euphorbiaceae) candlenut tree
mkaa

A tree commonly found near lake shores; native to Malaya and the Pacific Islands

Uses:

1. seed - drying oil used for paints (C)
2. bark - used medicinally as an astringent (L)

Ref: Hill, 1952, p. 196; Inter-Territorial Language Committee, 1963, p. 283; Willis, 1966, p. 38

16. Allium cepa (Alliaceae) onion

Widely cultivated throughout Kenya; native to Asia

Use:

bulb - cooked as part of soup or stews (C)

Ref: Suttie, 1970, pp. 378-85; Uphof, 1968, p. 24; Willis, 1966, p. 41

17. Aloe perryi (Liliaceae)

A perennial cultivated in drier regions; harvested after one year; probably introduced from the Mediterranean area

Use:

leaf juice - contains a glycoside which is likely to be the active principle in its medicinal use as a laxative and as a treatment for burns (E)

Ref: Hill, 1952, p. 252; McIlroy, 1963, p. 115; Nelson, 1951, pp. 441-2; Suttie, 1970, pp. 378-85; UNESCO, 1960, p. 61; Willis, 1966, p. 43

18. Anacardium occidentale (Anacardiaceae) cashew
mbibo, mkanju (tree), korosho (fruit)

A small tree planted where rainfall is 25 inches per annum or over, usually in Coast Province from 0-3000 feet; introduced from South America; first harvest ready in 10 years

Uses:

1. distal, terminal portion of the cashew "apple" (botanically the fruit), in layman's terms the nut - eaten whole after roasting or pressed for an edible nondrying oil used for cooking or as a lubricant for brakes (E)
2. fleshy applie-like "fruit" (botanically the peduncle and disk) - eaten as is or made into preserves (L)

Ref: East African Trade and Industry, 1963, pp. 26-9; East African Trade and Industry, 1968, p. 34; Hill, 1952, pp. 349-50; Inter-Territorial Language Committee, 1963, p. 268; McIlroy, p. 72; Pritchard, 1963, pp. 69 and 81; Savile and Bennison, 1959, pp. 156-7; Suttie, 1970, pp.

378-85; Schery, 1952, pp. 215, 229, 409, 486, and 323; Uphof, 1968, p. 34; Willis, 1966, p. 56

19. Ananas comosus (Bromeliaceae) pineapple

Usually cultivated in areas marginal for coffee in Central Province especially around Thika; native to South America

Uses:

1. fruit - edible as is or made into juice (E)
2. leaf fiber - made into cloth (L)

Ref: Farming Correspondent, 1968, p. 34; Greenway, 1961, pp. 146-9; Hill, 1952, pp. 40 and 431-2; O'Connor, 1966, p. 105; Pritchard, 1963, p. 105; Schery, 1952, pp. 480-4; Uphof, 1968, p. 35; Willis, 1966, p. 57

20. Antiaria toxicaria (Moraceae) false iroko
(alt. sp. Antiaris)

A forest tree usually 150 feet tall, found growing in Kakamega Forest in Nyanza Province and Lamu and Kwale Districts of Coast Province

Uses:

1. wood - white to yellow-white, soft and light, 23-34 bl/cu ft air dry, peels well; used for veneers (C)
2. sap - contains antiarin-x and z, both glucosides very likely the active principle for its medicinal use as a cardiac stimulant (C); arrow poison (L)

Ref: Dale and Greenway, 1961, p. 308; Hill, 1952, p. 50; Uphof, 1968, p. 41; Willis, 1966, p. 72

21. Aphania senegalensis (Sapindaceae)

An understory forest tree usually 30-40 feet tall, found in Nyanza Province, Taita District of Coast Province, Machakos District of Southern Province, and Isiolo District of Northern Province

Use:

wood - gray-brown with dark veining, medium hard, durable if not exposed to weather; used for turnery, cabinets, and interior carpentry (C)

Ref: Dale and Greenway, 1961, p. 238; Uphof, 1968, p. 42; Willis, 1966, p. 79

22. Arachis hypogaea (Leguminosae) groundnut
mnjugunyasa (plant), mgugu (raw nuts) peanut

Grows well in Nyanza Province and Coast Province; introduced from Brazil by the Portuguese; planted on small farms but could easily be harvested mechanically on large scale

Uses:

1. seed - eaten whole after roasting or made into a sauce by grinding coarsely and then cooking (L); pressed for an edible nondrying oil used for cooking or made into soap, lubricants, or illuminants (C)
2. presscake - the part remaining after extraction of the oil, used for cattle feed (C)
3. straw - when properly cured makes a valuable fodder (L)

Ref: Cogley, 1956, pp. 110-3; Hill, 1952, p. 200; Hill, 1947, pp. 140-6; Inter-Territorial Language Committee, 1963, p. 293; McIlroy, 1963, pp. 79-80; Savile and Wright, 1958, pp. 1-8; Schery, 1952, p. 320; Uphof, 1968, p. 44; Willis, 1966, p. 83

23. Areca catechu (Palmae) betelnut palm
mpopo

A palm bearing the betel nut planted in Coast Province; introduced from southern Asia

Use:

seed (nut) - sliced and mixed with leaves of Piper betel as a masticatory (C)

Ref: Hill, 1952, p. 276; Uphof, 1968, p. 46; Willis, 1966, p. 87

24. Artemisia kurramensis (Compositae) santonin

An herb introduced from the Mediterranean area

Use:

leaf and top - essential oil used medicinally as an anthelmintic against roundworms (L)

Ref: Nelson, 1951, p. 449; Schery, 1952, p. 269; Suttie, 1970, pp. 378-85; Willis, 1966, p. 92

25. Artocarpus incisa (Moraceae) breadfruit
mshelisheli

Often planted as a backyard crop; native to the East Indies

Use:

fruit - sliced, then boiled or fried before eating (L)

Ref: Inter-Territorial Language Committee, 1963, p. 302; Schery, 1952, p. 486; Suttie, 1970, pp. 378-85; Willis, 1966, p. 94

26. Artocarpus integra (Moraceae) jackfruit
(syn. A. integrifolia)
mfensi

A tree bearing huge, sweetly acid, multiple fruits from the trunk and lower branches; native to Malaya; a common backyard crop

Uses:

1. fruit - sliced and eaten cooked or raw (L)
2. seed - eaten roasted (L)

Ref: Inter-Territorial Language Committee, 1963, p. 275; Schery, 1952, p. 496; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 52; Willis, 1966, p. 94

27. Arundinaria alpina (Gramineae) mountain bamboo
mwanzi

Covers many large areas on the Mau and Aberdares Mountains in Rift Valley and Central Provinces and Mount Elgon in Nyanza Province

Use:

stem - building purposes (L); paper pulp (C - but not as suitable as some hardwoods)

Ref: Dale and Greenway, 1961, pp. 9-10; Willis, 1968, p. 94

28. Avena sativa (Gramineae) common oat

Planted both by small farmers and on large plantations in cool, rainy areas of the highlands; most likely native to north Africa or possibly the near East or temperate Russia; prefers a temperate climate such as that of the highlands

Use:

cereal - made into oatmeal or exported as whole grain (E); cattle feed (L)

Ref: Pritchard, 1963, p. 67; Savile, et. al., 1958, p. 233; Schery, 1952, pp. 385-8; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 60; Willis, 1966, p. 109

29. Avicennia marina (Avicenniaceae)
mchu, mtu

A spreading willow-like tree found in mangrove swamps in Coast Province

Use:

bark and leaf - tannin, 6% (L)

Ref: Dale and Greenway, 1961, pp. 581-2; Sykes and Simon, 1954, p. 62; Uphof, 1968, p. 60; Willis, 1966, p. 109

30. Balanites aegyptiaca (Balanitaceae)

A dry savanna tree usually 15-20 feet tall, found in Northern, Southern, Coast, and Nyanza Provinces to 4500 feet

Uses:

1. wood - pale yellow-brown, resistant to insects, durable, heavy, 48-50 lb/cu ft air dry; used for toolhandles and turnery (C)
2. bark - contains a saponin most likely to be the active principle in its use as an anthelmintic and as a remedy for syphilis (L)
3. fruit, kernel, root, and branches - most likely containing the same saponin as above; used as an anthelmintic, emetic, and laxative (L)
4. fruit pulp - toxic to cold-blooded animals only which makes it excellent for treatment of water supplies (L)

Ref: Dale and Greenway, 1961, p. 533; UNESCO, 1960, p. 24; Uphof, 1968, p. 65; Willis, 1966, p. 113

31. Barringtonia racemosa (Barringtoniaceae)

A tree found growing in Coast Province on stream banks

Use:

bark - tannin, 18% (L); powdered for use as a piscicide (L)

Ref: Dale and Greenway, 1961, p. 243; Uphof, 1968, p. 68; Willis, 1966, p. 120

32. Bauhinia thonningii (Leguminosae)
msegese, mbambangoma

A tree found in Coast, Rift Valley and Nyanza Provinces in wet savanna to 6000 feet

Uses:

1. root - remedy for bronchitis (L)
2. bark - red dye (L)
3. pod - soap substitute (L)

Ref: Dale and Greenway, 1961, p. 107; Inter-Territorial Language Committee, 1963, p. 301; Uphof, 1968, p. 70; Willis, 1966, p. 123

33. Bixa orellana (Bixaceae) annatto

A shrub native to South America which is cultivated in Coast Province; first harvest after two years

Use:

pigmented layer covering the seed - tasteless red-orange dye used for edible products such as butter and cheese (E)

Ref: Dalziel, 1948, p. 45; East African Trade and Industry, 1963, pp. 26-9; Hill, 1952, p. 133; McIlroy, 1963, p. 120; Uphof, 1968, p. 77; Williamson, 1955, p. 22; Willis, 1966, p. 137

34. Bombax rhodognaphalon (Bombacaceae) kapok
msufi

A tree found in Northern, Southern, and Coast Provinces in dry bush

Uses:

1. fiber surrounding the seeds - used for stuffing cushions (C)
2. bark - reddish-brown dye (L)

Ref: Dale and Greenway, 1961, p. 67; Inter-Territorial Language Committee, 1963, p. 305; Willis, 1966, p. 144

35. Borassus aethiopum (Palmae) african fan palm
(syn. B. flabellifer)

A palm found in Coast Province in the Coastal and Shimba Hills; tallest of Kenya palms about 80 feet tall

Uses:

1. wood - hard and heavy, very resistant to termites, probably used for building poles (L)
2. leaf - fibrous, used for making mats and baskets (L)
3. sap - made into palm wine by fermentation (L)

Ref: Dale and Greenway, 1961, p. 11; Uphof, 1968, p. 8; Willis, 1966, p. 147

36. Bosqueia phoberos (Moraceae)
(alt. sp. Bosquea)

A tree found in North Nyanza District, Nyanza Province and Lamu and Kwale Districts, Coast Province

Use:

sap - red dye (L)

Ref: Dale and Greenway, 1961, p. 75; Willis, 1966, p. 148

37. Boswellia hildebrandtii (Burseraceae) frankincense

A tree found in Northern, Southern, and Coast Provinces in dry bush

Use:

stem exudate - gum, used for incense (C)

Ref: Dale and Greenway, 1961, p. 75; Willis, 1966, p. 149

38. Brachylaena hutchinsii (Compositae) muhuhu
muhuhu

A small, often misshapen tree usually 80 feet tall found in Coast and Central Provinces in mixed forest 5000-6000 feet

Use:

wood - pale yellow to pale brown with a characteristic storied structure, strong and heavy, 60-62 lb/cu ft air dry, extremely durable in ground and sea water; used for floor blocks, and likely, for building poles and boats (E); essential oil extracted from the wood used for perfume and cremations (E)

Ref: Dale and Greenway, 1961, pp. 115-7; Rendle, 1969, pp. 142-3; Uphof, 1968, p. 83; Willis, 1966, p. 152

39. Brassica oleracea cabbage

A green vegetable widely cultivated; origin uncertain

Use:

leaf (head) - cooked as a green vegetable (C)

Ref: Suttie, 1970, pp. 378-85; Uphof, 1968, p. 85; Willis, 1966, p. 155

40. Bridelia micrantha (Euphorbiaceae)

A small tree usually 40 feet tall widely spread at forest-edge or along rivers from the coast to 7000 feet

Use:

wood - heartwood resistant to termites, burns well; used for building poles, fuelwood, and charcoal (C)

Ref: Dale and Greenway, 1961, p. 187; Uphof, 1968, p. 86; Willis, 1966, p. 157

41. Caesalpinia coriaria (Leguminosae)

A tree planted along the coast where it yields best but may be planted at higher altitudes; introduced from India but native to South America and the West Indies

Use:

dried pod - tannin, 40-50% (C)

Ref: Hill, 1952, p. 124; Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 93; Willis, 1966, p. 173

42. Caesalpinia cristata (Leguminosae)
msolo, mkomwe

A thorny shrub growing in dry savanna

Use:

seed - counters in games (L)

Ref: Inter-Territorial Language Committee, 1963, p. 304; Uphof, 1968, p. 93; Willis, 1966, p. 173

43. Caesalpinia spinosa (Leguminosae)

A shrub native to South America which is at present a research crop only

Use:

fruit - tannin, 43-51% (RC)

Ref: Hill, 1952, p. 124; Suttie, 1970, 378-85; Thonner, 1962, p. 251; Williams, 1949, p. 50; Willis, 1966, p. 173

44. Cajanus cajan (Leguminosae) pigeon pea
(syn. C. indicus)
mbaazi

A pea-bearing shrub widely cultivated especially in areas marginal for cow peas; drought resistant because of a long tap root; ready for harvest after six months; an ancient food crop of Kenyans, very hardy, but not bred for high yield; may be native to Africa

Uses:

1. foliage - forage crop which rivals alfalfa in quality (L)
2. seed - legume for human consumption (C)

Ref: Cogley, 1956, pp. 158-9; Will, 1952, p. 343; Inter-Territorial Language Committee, 1963, p. 265; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 94; Willis, 1966, p. 174

45. Calotropis procera (Asclepiadaceae) dead sea fruit
auricula tree

A tree found in Northern and Southern Provinces in dry areas

Uses:

1. stem exudate - latex containing trypsin, an active laboratory enzyme used to curdle milk and to ferment beer (C) and several glycosides most likely the active principle in its use as a remedy for syphilis, leprosy and elephantiasis (L) and as a laxative (C)
2. fruit pulp - contains several glycosides likely to be the active principle in its use as an abortifacient, laxative, and anthelmintic against guinea worm (L)

Ref: Dale and Greenway, 1961, p. 58; Hill, 1952, p. 49; UNESCO, 1960, p. 25; Uphof, 1968, p. 98; Willis, 1966, p. 182

46. Camellia sinensis (Theaceae) tea
chai

A small shrub cultivated mostly in Nyanza Province, Rift Valley and Central Provinces at altitudes of 5000-8000 feet; native to China and India; first harvested in five to seven years with a lifespan of 50-100 years

Use:

leaf - cured for the beverage tea (E)

Ref: Barclays, 1966, pp. 11-2; Darby, 1963, pp. 452-3; Farming Correspondent, 1968, p. 34; Gamble, 1959, pp. 167-8; Hanger, 1959, pp. 167-8; Kaplan, et. al., 1967, p. 460; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 100; Willis, 1966, p. 186

47. Capparis spinosa (Capparidaceae) capers

A low, trailing shrub native to the Mediterranean area

Use:

unexpanded flower bud - flavoring for pickles and relishes (C)

Ref: Hill, 1952, p. 445; Schery, 1952, p. 262; Uphof, 1968, p. 104; Willis, 1966, p. 195

48. Capsicum annuum (Solanaceae) cayenne pepper
(syn. C. frutescens) green pepper
pili pili chili pepper

An annual, native to Brazil, cultivated wherever rainfall is adequate

Use:

fruit - whole in soups and stews or ground into cayenne pepper depending upon variety (E)

Ref: East African Trade and Industry, 1963, p. 26; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 105; Willis, 1966, p. 195

49. Carica papaya (Caricaceae) papaya
mpapai

A tree native to tropical America; planted in Central Province, 4000-4600 feet; bears at the end of the first year

Uses:

1. fruit - eaten as is (ripe) or made into fruit juice (C); latex exuding from slashes made in unripe fruit contain papain used for ulcerous skin conditions, dissolving membranes commonly found in diphtheria, or in nasal spray (E) or for meat tenderizer (E)
2. leaf - wrapped around meat to tenderize it while cooking (L)

Ref: Inter-Territorial Language Committee, 1963, p. 296; Lewis and Woodward, 1950, pp. 192-4; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 107; Williamson, 1955, p. 31; Willis, 1966, p. 198

50. Catha edulis (Celastraceae)
murungu

miraa
khat

A small tree usually 20 feet tall growing in high-land forests and cultivated in Meru District, Central Province for miraa before reaching tree size by trimming

Uses:

1. wood - pale golden-yellow to dark brown, moderately hard and strong, 42 lb/cu ft air dry, long fibered; used for cabinets and blotting paper (C)
2. leaf and twig - masticated as a stimulant or infused and the resulting tea drunk (C)

Ref: Dale and Greenway, 1961, p. 134; Hill, 1952, p. 481; Margetts, 1967, pp. 351-61; Uphof, 1968, p. 114; Willis, 1966, p. 209

51. Ceiba pentandra (Bombacaceae)

silk cotton tree
kapok tree

A tree native to South America now cultivated and naturalized in East Africa; grows well from sea level to 2500 feet; first harvested after four years

Uses:

1. fiber surrounding the seeds - hollow, filled with air, very buoyant and impermeable to water; used for life-saving apparatus, sleeping bags, insulation, and stuffing material (E)
2. seed - pressed for an edible nondrying oil used for cooking or for soap (E)
3. presscake - the part remaining after removal of the oil; used as domestic animal feed (C)

Ref: Cobley, 1956, pp. 60-3; Greenway, 1950, pp. 150-1; Hill, 1952, p. 439; McIlroy, 1963, pp. 6-7; Savile, 1959, pp. 160-1; Uphof, 1968, p. 116; Willis, 1966, p. 212

52. Ceriops candolliana (Rhizophoraceae) mangrove
mkandaa

A tree commonly found growing in mangrove swamps of Coast Province

Uses:

1. bark - tannin (C); red dye (L)
2. wood - strong and durable; used for building poles (C)

Ref: Inter-Territorial Language Committee, 1963, p. 283; Willis, 1966, p. 222

53. Ceriops tagal (Rhizophoraceae) mangrove
(syn. C. candolleianum)

A tree found in mangrove swamps of Coast Province

Uses:

1. bark - tannin, 24-42% (C)
2. wood - durable, burns well; used for boats, building poles, and as fuelwood (C)

Ref: Dale and Greenway, 1961, p. 399; Uphof, 1968, p. 120; Willis, 1966, p. 222

54. Chlorophora excelsa (Moraceae) fustic tree
african oak
iroko

A tree usually 100 feet tall in savanna and to 160 feet tall in the forest; rather scarce at present because of excessive cutting without replanting; found in Coast, Central, and Nyanza Provinces in low-land rainforests and wet savanna from sea level to 4500 feet

Use:

wood - heartwood brown, resistant to termites, fire, shipworm, and fungi; used for ships and most likely for building poles (C)

Ref: Dale and Greenway, 1961, p. 309; Uphof, 1968, p. 126; Willis, 1966, p. 239

55. Chrysanthemum cinerariifolium (Compositae) pyrethrum
(syn. Pyrethrum)

Perennial species successfully cultivated in cooler areas only of Coast, Southern, Central, Rift Valley and Nyanza Provinces; seedlings begin producing after four to six months and are picked for three to four seasons; introduced from southeastern Europe

Use:

flower head - made into an insecticide (pyrethrins), which is non-toxic to humans and animals and is extremely quick acting with no resistance problems after repeated applications (E)

Ref: Barclays, 1966, pp. 13-4; East African Trade and Industry, 1968, p. 34; Ensoll, 1970, p. 40; Hanger, 1959, pp. 161-3; Kenya Government, 1965, (Map); Kroll, 1959, pp. 161-3; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 128; Willis, 1966, p. 243

56. Cicer arietinum (Leguminosae) chick pea

An annual herb cultivated throughout Kenya; especially well adapted to arid and semi-arid conditions; native to Southern Europe

Use:

seed - dried and cooked as a vegetable (C)

Ref: Hill, 1952, pp. 337-8; Schery, 1952, p. 404; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 129; Willis, 1966, p. 247

57. Cichorium intybus (Compositae) chicory
succory

A perennial native to Europe; cultivated where rainfall is adequate

Uses:

1. root - roasted and ground as a coffee substitute (C)
2. leaf - cooked and eaten as a green vegetable (L)

Ref: Schery, 1952, p. 432; Suttie, 1970, p. 380; Uphof, 1968, p. 130; Willis, 1966, p. 247

58. Cinchona spp. (Rubiaceae) quinine

A tree native to the Andean Highlands of South America

Use:

bark - contains the drug quinine used for the treatment of malaria (RC)

Ref: Schery, 1952, p. 432; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 130; Willis, 1966, pp. 247-8

59. Citrus aurantium (Rutaceae) common orange
(syn. C. bigaradia)
mchungwa, mdanzi

Native to southeastern Asia; cultivated in Coast Province

Use:

fruit - eaten as is or made into juice (E);
essential oil from fruit rind used for perfume and flavoring (E)

Ref: East African Trade and Industry, 1963, p. 27; Inter-Territorial Language Committee, 1963, pp. 272-3; Uphof, 1968, p. 133; Willis, 1966, pp. 250-1

60. Citrus nobilis (Rutaceae) mandarin orange tree
(syn. C. reticulata)
mchenze

Native to southeastern Asia; cultivated in Coast Province

Use:

fruit - mandarin orange (E)

Ref: East African Trade and Industry, 1963, p. 27; Inter-Territorial Language Committee, 1963, p. 271; Willis, 1966, pp. 150-1

61. Cocos nucifera (Palmae) coconut
mnazi

Native to the old world tropics; prefers hot, moist climates of Coast Province but can be cultivated in other regions provided there is high temperatures and rainfall of 40 inches per annum and over; is first harvested in 8-10 years, full bearing in 15 years, normal life of 60 years

Uses:

1. endosperm (flesh) - copra which is pressed for a valuable edible nondrying oil used for cooking, margarine, soap making, and cosmetics; copra is also dessicated for use as a confection (C)
2. presscake - the part remaining after expression of the oil used for cattle feed (C)
3. pericarp (husk) - after soaking in water for approximately one month yields coir fiber used for brushes, ropes, and cordage (C)
4. endocarp (shell) - fuel and charcoal (C)
5. leaf - fibrous, made into baskets and mats (L)
6. unopened flower spathe - when wounded yields a sap rich in sugars and vitamin B from which an intoxicating drink is made, palm wine (L)

Ref: East African Trade and Industry, 1963, p. 29; Cobley, 1956, pp. 116-22; Greenway, 1950, p. 151; Savile and Bennison, 1959, pp. 57-8; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 141; Willis, 1966, p. 260

62. Coffea arabica (Rubiaceae) Arabian coffee
kahawa

A small tree believed to have originated in the Abyssinian Highlands; cultivated at 4500 feet in Central, Nyanza, Rift Valley, and Southern Provinces; produces the first crop after two or three years, full bearing in 8 years with a life span of 30 years; usually requires shading by Cordia abyssinica and Erythrina indica

Use:

fruit - roasted for the beverage coffee (E)

Ref: Dale and Greenway, 1961, p. 436; Ensoll, 1970, p. 40; Hanger, 1959, pp. 153-5; McIlroy, 1963, pp. 38-43; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 142; Willis, 1966, pp. 263-4

63. Coffea canephora (Rubiaceae) robusta coffee
kahawa

A lowland type of coffee tree which grows well in Coast, Southern, and Nyanza Provinces below 4500 feet; native to Africa; begins bearing after four years; usually requires shading with Albizia stipulata, Cordia holstii, or Erythrina sp.

Use:

fruit - roasted for the beverage coffee, inferior to C. arabica (E)

Ref: Copley, 1956, pp. 229-34; Kenya Government, 1965, (Map); McIlroy, 1963, pp. 38-43; Savile and Hanger, 1959, pp. 155-6; Schery, 1952, p. 305; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 143; Willis, 1966, pp. 263-4

64. Colocasia antiquorum (Araceae) coco yam
myugwa

Planted on small holdings where rainfall is adequate especially in Rift Valley Province on the slopes of the valley and in Coast Province; native to south-eastern Asia

Uses:

1. tuber - cooked as a starch source in the diet (L)
2. leaf - cooked as a green vegetable (L)

Ref: Hill, 1952, p. 370; Inter-Territorial Language Committee, 1963, p. 324; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 144, Willis, 1966, p. 267

65. Cordia abyssinica (Ehretiaceae)
(syn. C. holstii)

A tree found growing in Meru Forest, Central Province and Kakamega Forest, Nyanza Province, 4000-6000 feet

see Coffea

Ref: Dale and Greenway, 1961, p. 69; Willis, 1966, p. 283

66. Coriandrum sativum (Umbelliferae) coriander
mgilgilani

A herbaceous annual native to Europe, planted in Coast Province

Use:

- seed - a constituent of curry powder (C)

Ref: Copley, 1956, p. 218; Inter-Territorial Language Committee, 1963, p. 277; Schery, 1952, p. 262; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 153; Willis, 1966, p. 284

67. Cucurbita moschata (Cucurbitaceae) cushaw
mboga

A large gourd probably native to the Americas

Use:

fruit - cooked and eaten as a vegetable, similar to pumpkin (L)

Ref: Cogley, 1956, p. 297; Hill, 1952, p. 382; Inter-Territorial Language Committee, 1963, p. 269; Uphof, 1968, p. 153; Willis, 1966, p. 306

68. Cupressus lusitanica (Cupressaceae) cypress

A tree introduced to the highlands as a plantation timber crop; native to Mexico, Guatemala, and Honduras; grows to maturity in 30 years

Use:

wood - durable; used for general construction work (C)

Ref: Barclays, 1966, p. 183; Willis, 1966, p. 320

69. Cupressus macracarpa (Cupressaceae) Monterey cypress

A tree, native to central California, introduced to the highlands as a plantation timber crop

Use:

wood - durable; used for general construction work (C)

Ref: Periera, 1952, p. 73-6; Willis, 1966, p. 310

70. Cynometra weberi (Leguminosae)
mfunda

A tree around 50 feet tall found in Kwale and Kilifi Districts in Brachylaena Forests of Coast Province

Use:

wood - hard and dense, burns well; used as firewood (L)

Ref: Dale and Greenway, 1961, p. 103; Willis, 1966, p. 321

71. Dalbergia melanoxylon (Leguminosae) African ebony
mpingo, kikwaju

A tree, usually 10-35 feet tall growing in Coast, Southern, and Northern Provinces in dry bush and savanna below 4000 feet

Use:

wood - heartwood purple to brownish black, very hard and heavy, 82 lb/cu ft air dry, very durable, very resistant to climatic changes; used for fancy small articles especially musical instruments, walking sticks, and carvings, and for brush backs (E)

Ref: Dale and Greenway, 1961, p. 362; Rendle, 1969, pp. 96-7; Uphof, 1968, p. 172; Willis, 1966, p. 328

72. Dioscorea dumentorum (Dioscoreaceae) yam
viazi vikuu

A vine, most likely native to Africa

Use:

tuber - a source of starch in the diet (L); contains dioscorine, an alkaloid which may be the starting material for many drugs and hormones including cortisone and sex hormones (RC)

Ref: Schery, 1952, p. 438; Suttie, 1970, pp. 378-85; Watt and Breyer-Brandwijk, 1962, pp. 383-7; Willis, 1966, p. 360

73. Diospyros abyssinica (Ebenaceae) ebony
(syn. Maba)
mdaa - mwitu

A tree usually 90 feet tall growing in the forests of Coast Province and highland forests of Central Province to 7000 feet

Use:

wood - strong and tough in bending, moderately heavy, 47-52 lb/cu ft air dry; used for loom shuttles for weaving sisal cloth, fancy small articles, inlay work, toolhandles, and carvings (E)

Ref: Dale and Greenway, 1961, p. 172; Uphof, 1968, p. 323; Willis, 1966, p. 360

74. Dobera loranthifolia (Salvadoraceae)
msiga

A tree commonly found in Coast and Southern Provinces

Use:

young branches - teeth cleaners (L)

Ref: Dale and Greenway, 1961, p. 496; Inter-Territorial Language Committee, 1963, p. 303; Willis, 1966, p. 373

75. Dodonaea viscosa (Sapindaceae) swith sorrel
mkaa - pwani

A tree widespread from sea level to 9000 feet

Use:

entire plant - cover crop (L)

Ref: Dale and Greenway, 1961, p. 511; Uphof, 1968, p. 186; Willis, 1966, p. 373

76. Dovylis caffra (Flacourtiaceae) kei apple
(syn. D. engleri)

A common hedge plant which is native to South Africa

Use:

fruit - preserves and jams (L)

Ref: Dale and Greenway, 1961, p. 224; Schery, 1952, p. 503; Uphof, 1968, p. 188; Willis, 1966, p. 378

77. Durio zibethinus (Bombacaceae) durian
mduriani

A kind of breadfruit introduced from the East Indies

Use:

fruit - eaten as is (L)

Ref: Inter-Territorial Language Committee, 1963, p. 274; Schery, 1952, p. 490; Uphof, 1968, p. 190; Willis, 1966, p. 386

78. Eleusine coracana (Gramineae) finger millet
ulezi African millet

An erect sedge, two to three feet tall which matures three to five months after planting; probably native to Africa; one of the traditional food crops of the country, very hardy but not bred for high yield

Use:

cereal - made into a very nutritious porridge or ground for bread (C); fermented for native beer

(L); used as domestic animal feed (L)

Ref: Hill, 1952, pp. 330-1; Savile, et. al., 1958, pp. 229-30; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 197; Willis, 1966, p. 397

79. Embelia schimperi (Myrsinaceae)
(syn. E. kilimandscharia)

A tree found west and south of Mount Kenya, Central Province, Limuru and Ngong Hills, Southern Province, and Kakamega Forest, Nyanza Province

Use:

root and seed - contain embelin the most likely active principle in its use as an anthelmintic (L)

Ref: Dale and Greenway, 1961, p. 330; Willis, 1966, p. 400

80. Encephalartos hildebrandtii (Samiaceae) kaffir bread
(syn. E. caffer)
mkwanga, msapo, mkamwa

A tree found in dry forests and bush of Coast Province

Uses:

1. nut-like kernel - boiled, dried and ground to make flour (L)
2. pith of stem - chopped, fermented, dried and pounded into flour which can be made into a gruel (L)

Ref: Dale and Greenway, 1961, p. 2; Uphof, 1968, p. 199; Willis, 1966, p. 403

81. Englerodaphne subcordata (Thymelaeaceae)
(syn. E. leiosiphon)

A tree commonly found east of the Rift Valley, Rift Valley Province

Use:

stem fiber (bast) - local cordage (L)

Ref: Dale and Greenway, 1961, p. 555; Willis, 1966, p. 405

82. Ensete ventricosum (Musaceae) wild banana
(alt. sp. E. ventricosa)

Found in heavy rainfall districts, 5000-8000 feet

Uses:

1. leaf petiole - strong fiber used for local cordage (L)
2. leaf blade - used for thatch (L)
3. seed - black, used for rosary beads (L)
4. stalk of inflorescence - cooked and eaten as a green vegetable (L)

Ref: Dale and Greenway, 1961, p. 10; Willis, 1966, p. 406

83. Erythrina sp. (Leguminosae)

see Coffea

84. Erythrophleum guineense (Leguminosae) redwater tree
(alt. sp. E. guinense) sasswood
mbaraka, mkelekale, mkuu

A tree usually 100 feet tall found in forests of Coast Province

Uses:

1. wood-heartwood extremely durable, very resistant to termites and borers, hard and heavy, 60 lb/cu ft air dry; used for construction work, bridges, door frames, and sleepers (C)
2. bark - tannin and a red dye (L)
3. seed - arrow poison or picicide (L)

Ref: Dale and Greenway, 1961, p. 104; Uphof, 1968, p. 206; Willis, 1966, p. 424

85. Eucalyptus astringens (Myrtaceae) brown mallet

A tree introduced into the highlands from Australia

Use:

bark - tannin, 40% (RC)

Ref: Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 207; Willis, 1966, p. 427

86. Eucalyptus globulus (Myrtaceae)

A tree usually 160 feet tall introduced to the highlands as a plantation timber crop; fast growing

Use:

wood - heartwood light yellow brown, strong but only moderately durable; used for boats, tool-handles, posts, and very likely, for fuelwood and building poles (C)

Ref: Penfold, 1961, pp. 116-7; Willis, 1966, p. 427

87. Eucalyptus redunca (Myrtaceae)

A tree introduced into the highlands from Australia

Use:

bark and wood - tannin, 19% (RC)

Ref: Sykes and Simon, 1954, pp. 59-61; Uphof, 1968, p. 209; Willis, 1966, p. 427

88. Eucalyptus saligna (Myrtaceae)

A tree introduced into the highlands from Australia as a plantation timber tree; fast growing

Use:

wood - heartwood tough and fairly durable, moderately heavy; used for construction work, flooring, boats, sleepers, and very likely, for fuelwood and building poles (C)

Ref: Penfold, 1961, pp. 116-7 and 227; Willis, 1966, p. 427

89. Eucalyptus sideroxylon (Myrtaceae) red ironbark

A tree introduced from Australia into the highlands

Use:

bark - tannin, 30% (RC)

Ref: Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 210; Willis, 1966, p. 427

90. Euclea fruticosa (Ebenaceae)

mday, mday - mwitu

A tree commonly found in Coast Province

Use:

root - black dye (L)

Ref: Dale and Greenway, 1961, p. 177; Willis, 1966, p. 428

91. Fagopyrum esculentum (Polygonaceae) common buckwheat

An herb, probably native to central Asia; better adapted to poor soils than true cereals; a crop of cool, moist climates especially adapted to high elevations; often planted in the highlands

Uses:

1. cereal (pseudo) - sold as whole grain (E) or ground into meal or flour (C)
2. entire plant - bee plant (L)

Ref: Savile, et. al., 1958, p. 228; Schery, 1952, pp. 398 and 544; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 219; Willis, 1966, p. 443

92. Gossypium hirsutum (Malvaceae) cotton
pamba

Commonly planted in Coast and Nyanza Provinces as part of irrigation and resettlement schemes; 6-9 months before harvest

Uses:

1. lint surrounding the seeds - made into thread, fabrics, etc. (E)
2. linters surrounding the seeds (short hairs remaining on the seeds after removal of the lint) - made into mattresses, upholstery, rayon, explosives, x-ray photographic film, shatterproof glass, and plastics (C)
3. seed - pressed for one of the world's most valuable drying oils (C)
4. presscake - the part remaining after removal of the oil for domestic animal feed or fertilizer (it can be fed to cattle only because it contains gossypol which is toxic to other livestock) (C)

Ref: Empire Cotton Growing Corporation, 1959, pp. 158-9; Greenway, 1950, pp. 146-9; Hanger, 1959, pp. 158-9; Kaplan, et. al., 1967, p. 463; Kenya Government, 1965, (Map); Suttie, 1970, pp. 378-85; Uphof, 1968, p. 248; Willis, 1966, p. 491

93. Gynandropsis gynandra (Cleomaceae)
mkabilishemsi

Use:

- leaf - contains an acrid, volatile oil used as a remedy for eye and ear ailments (L)

Ref: Inter-Territorial Language Committee, 1963; Williamson, 1955, pp. 63-4; Willis, 1966, p. 164-5

94. Hagenia abyssinica (Rosaceae)

A tree found growing in high altitude zones 9000 feet and up; one of the last trees in the heath zone

Use:

female inflorescence - contains kosotoxin, a yellow amorphous substance which is believed to be the active principle in its use as an anthelmintic against tapeworm (L)

Ref: Dale and Greenway, 1961, p. 401; Uphof, 1968, p. 261; Watt and Breyer-Brandwijk, 1962, p. 889; Willis, 1966, p. 513

95. Helianthus annuus (Compositae) sunflower

Probably native to Mexico; grows well in moderately moist climate at altitudes from medium to high; flowers are premature at altitudes found in lowlands; dwarf variety ready for harvest in 3-5 months, giant variety ready in 4-6 months

Uses:

1. seed - pressed for a semi-drying edible oil used for cooking or for paint, varnish, or soap (C)
2. presscake - the part remaining after removal of the oil, used for domestic animal feed or fertilizer (C)

Ref: Cobley, 1956, p. 108; Hill, 1947, pp. 150-3; Savile and Wright, 1958, pp. 1-9; Schery, 1952, p. 328; Uphof, 1968, p. 264; Willis, 1966, p. 527

96. Heritiera spp. (Sterculiaceae)

A genus found in mangrove swamps, Coast Province, where river water and sea water mix

Uses:

1. wood - durable; used for dhow masts (C)
2. bark - tannin, 14-15% (L)

Ref: Dale and Greenway, 1961, p. 548; Sykes and Simon, 1954, pp. 59-65; Willis, 1966, p. 536

97. Hibiscus tiliaceus (Malvaceae)

mtakawa, mpia, mkungu-mwitu

A tree commonly found close to mangrove swamps,
Coast Province, in sandy soil

Use:

stem fiber (bast) - local cordage (L)

Ref: Dale and Greenway, 1961, p. 262; Hill, 1947, p. 34;
Uphof, 1968, p. 268; Willis, 1966, p. 544

98. Hordeum vulgare (Gramineae) common barley
shayiri

A cereal, probably native to southern Asia; grows
well in the cool, high altitudes of the highlands

Use:

cereal - made into European type beer (C); used
for hog feed (L)

Ref: Savile, et. al., 1958, p. 231; Schery, 1952, p.
388; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 272;
Willis, 1966, p. 555

99. Hyphaene coriacea (Palmae) gingerbread palm
mkoma, mkoche, mlala doum palm

Commonly found in Northern and Coast Provinces often
on worn out soils

Uses:

1. leaf fiber - baskets and mats (L)
2. leaf - thatch (L)
3. sap - fermented into palm wine (L)
4. fruit pulp - eaten as is (L)

Ref: Dale and Greenway, 1961, p. 12; Inter-Territorial
Language Committee, 1963, p. 317; Uphof, 1968, p. 276;
Willis, 1966, p. 570

100. Ilex mitis (Aquifoliaceae)

A tree found in montane forests of the highlands,
4500-9000 feet

Use:

bee plant - honey very white and highly rated (L)

Ref: Dale and Greenway, 1961, p. 50; Willis, 1966, p.
575

101. Ipomea batatas (Convolvulaceae) sweet potato
viazi vitamu

Introduced by the Portuguese explorers; grows at 0-6000 feet; useful for opening new land

Use:

tuber - source of starch in the diet (C)

Ref: Savile and Wright, 1958, pp. 8-9; Schery, 1952, p. 429; Suttie, 1970, pp. 378-85; Uphof, 1968, pp. 282-3; Willis, 1966, pp. 579-80

102. Jateorhiza palmata (Manispermaceae)
mkaumwa

A climbing perennial herb commonly found at low altitudes

Use:

root - contains three active alkaloids which may be the active principle or it may simply act as a nonstringent bitter in its use as a remedy for dysentery and stomach complaints

Ref: Inter-Territorial Language Committee, 1963, p. 284; Watt and Breyer-Brandwijk, 1962, pp. 757-8; Williamson, 1955, p. 70; Willis, 1966, p. 589

103. Juniperus procera (Cupressaceae) African pencil cedar

A cedar, the largest in the world, attaining 120 feet, widely distributed in drier highland forests, 3500-9500 feet

Uses:

1. wood - heartwood extremely resistant to termites, very durable in the ground, light to medium heavy, 32-38 lb/cu ft air dry, difficult to impregnate, distinctive "cedarlike" scent; used for pencils, wardrobe liners, flooring, roofing shingles, posts, and building poles (E)
2. wood shavings - distilled for cedarwood oil used for moth repellent, deodorant, and perfume (E)

Ref: Dale and Greenway, 1961, pp. 3-4; Schery 1952, p. 269; Uphof, 1968, p. 291; Willis, 1966, p. 593

104. Kigelia aethiopum (Bignoniaceae) sausage tree
mvungunya, mvungavunga, mwegea

A tree which is widely spread in wet savanna and along rivers in dry areas

Use:

fruit - sliced and baked for use as a flavoring for native beer (pombe) (L)

Ref: Dale and Greenway, 1961, p. 60; Inter-Territorial Language Committee, 1963, p. 269; Willis, 1966, p. 599

105. Lablab niger (Leguminosae) hyacinth bean
(syn. Dolichos lablab)

An annual herb cultivated in areas where there is adequate rainfall; native to India

Use:

seed - dried and cooked as a vegetable (C)

Ref: Hill, 1952, p. 343; Schery, 1952, p. 406; Uphof, 1968, p. 186; Willis, 1966, p. 610

106. Lannea alata (Anacardiaceae)

A tree commonly found in Coast, Southern, and Northern Provinces

Use:

fiber on surface of root - used for heat insulation (C)

Ref: Dale and Greenway, 1961, p. 23; Willis, 1966, p. 615

107. Lasiosiphon glaucus (Thymelaeaceae)

A tree commonly found at the forest-edge, 6500-10,000 feet

Use:

stem fiber (bast) - local cordage (L)

Ref: Dale and Greenway, 1961, p. 556; Willis, 1966, p. 620

108. Lawsonia inermis (Lythraceae) henna
mhina, mkokoa, mheni

A tree commonly found in Coast Province and along rivers in Northern Province

Use:

leaf - steeped in water makes a red-orange dye used for fabrics and leather (C)

Ref: Dale and Greenway, 1961, p. 258; Hill, 1952, p. 129; Inter-Territorial Language Committee, 1963, p. 279; Schery, 1952, p. 245; Willis, 1966, p. 624

109. Leptospermum citratum (Myrtaceae) leptospermum

Use:

leaf - yields a pungent essential oil (C)

Ref: Jex-Blake, 1957, p. 118; Uphof, 1968, p. 308; Willis, 1966, p. 543

110. Luffa cylindrica (Cucurbitaceae) vegetable sponge
(syn. L. aegyptiaca)
mdodoki

A climbing plant native to the tropics

Uses:

1. young fruit - used as a vegetable (L)
2. mature fruit - fibrous, used for scouring pots and pans and for a dishcloth when dried (L)
3. root - contains a saponin the most likely active principle in its use as a laxative (L)

Ref: Hill, 1952, p. 51; Inter-Territorial Language Committee, 1963, p. 273; Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 320; Watt and Brey-Brandwijk, 1963, p. 360; Willis, 1966, p. 674

111. Lycopersicon esculentum (Solanaceae) tomato
(alt. sp. Lycopersicum)

Widely cultivated; native to South America

Use:

fruit - cooked as part of stew (C)

Ref: Suttie, 1970, pp. 378-85; Uphof, 1968, p. 676; Willis, 1966, p. 321

112. Macadamia spp. (Proteaceae) macadamia nut

Native to Australia; suitable for both small and large scale growers; ideally suited for coffee areas where it could act as an alternative crop of nearly equal value

Use:

seed - edible as a nut (E)

Ref: East African Trade and Industry, 1963, p. 27; Schery, 1952, p. 414; Suttie, 1970, pp. 378-85; Willis, 1966, p. 680

113. Mangifera indica (Anacardiaceae) mango
mwembe

Native to eastern Asia; grown in the coastal belt, Coast Province where the tree could be considered wild, fruit may be picked before ripe hence could become a valuable export fruit in the future to Europe

Use:

fruit - eaten as is (C - in most East African markets)

Ref: Inter-Territorial Language Committee, 1963, p. 320; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 329; Wheatley, 1956, pp. 46-55; Willis, 1966, p. 692

114. Manihot esculenta (Euphorbiaceae) cassava
muhogo tapioca

Native to South America; introduced to East Africa by the Portuguese; harvestable after eight months but usually takes 16 months to give maximum yield; usually planted below 6000 feet

Use:

root - a source of starch in the diet (C); could be exported as tapioca (E?)

Ref: Inter-Territorial Language Committee, 1963, p. 314; Suttie, 1970, pp. 378-85; Schery, 1952, p. 206; Uphof, 1968, p. 330; Willis, 1966, p. 692

115. Manilkara sansibarensis (Sapotaceae)
mngambo, mguvi, mwambo, mti-chuma

A tree commonly found in Coast Province in bush and forest

Use:

wood - great resistance to wear and tear, durable in water; used for flooring, mallets, dhows, construction work that will be submerged in water

Ref: Dale and Greenway, 1961, p. 526; Willis, 1966, p. 693

116. Markhamia platycalyx (Bignoniaceae)

A tree usually 80 feet tall growing in Nyanza Province and Embu District of Coast Province or forest-edge and along rivers

Use:

wood - pale yellow-brown, resistant to decay; used for building poles (C)

Ref: Dale and Greenway, 1961, p. 62; Willis, 1966, p. 697

117. Mascarenhasia elastica (Apocynaceae)
mgoa

A tree found in Kwale District, Coast Province in forests

Use:

stem exudate - yields latex which makes an inferior kind of rubber (RC?)

Ref: Dale and Greenway, 1961, p. 47; Uphof, 1968, p. 333; Willis, 1966, p. 699

118. Matricaria chamomilla (Compositae) chamomille

Native to Eurasia

Use:

flower head (dried) - yields a thick, blue volatile oil containing apigenine which has spasmolytic properties; used as a tonic and stimulant (C)

Ref: Dale and Greenway, 1961, p. 47; Uphof, 1968, p. 333; Willis, 1966, p. 699

119. Millettia dura (Leguminosae)

A tree which grows in secondary scrub and forest-edge 4000-5000 feet in Central Province

Uses:

1. entire plant - coffee shade (C)
2. wood - tough; used for toolhandles (L)

Ref: Dale and Greenway, 1961, p. 370; Willis, 1966, p. 727

120. Morus lactea (Moraceae)

A tree usually 80 feet tall found in the under-story of forests of North Nyanza, Nyanza Province, and Kwale District, Coast Province

Use:

wood - heartwood brown, hard, durable in ground and fresh water, moderately heavy, 43-50 lb/cu ft air dry; used for cabinets, flooring, and fancy articles (C)

Ref: Dale and Greenway, 1961, p. 324; Willis, 1966, p. 744

121. Mundulea sericea (Leguminosae)
mtupa-wa-pori, mkwaia

A tree commonly found in savannas of Coast and Northern Provinces

Uses:

1. seed, leaf, and bark - picicide (L)
2. bark and root - insecticide (L)

Ref: Dale and Greenway, 1961, p. 371; Uphof, 1968, p. 352; Willis, 1966, p. 746

122. Musa spp. (Musaceae) plantain
ndizi, mgomba banana

Introduced from tropical Asia well before the middle ages of Europe; one of the ancient food crops of Kenyans; at present, many grow wild all over the country wherever rainfall is adequate; propagated by suckers; 12 months before the first harvest

Uses:

1. fruit - eaten boiled, steamed, or roasted (plantain) or the sweeter varieties are eaten as is (banana) (C)
2. leaf - cattle fodder or mulch (L)
3. leaf fibers - local cordage (L)

Ref: Baker and Simmons, 1951, pp. 281-90; Inter-Territorial Language Committee, 1968, p. 277; Jackson, et. al., 1958, pp. 79-80; McIlroy, 1963, p. 471; Suttie, 1970, pp. 378-85; Willis, 1966, p. 747

123. Nicotiana tabacum (Solanaceae) tobacco
tumbaku

Native to North America; approximately 4 months before harvest followed by 4-6 weeks of fermentation; usually not grown above 4200 feet because of high incidence of white mold which delays ripening in the field

Use:

leaf - made into smoking or chewing tobacco (C);
smoke contains nicotine which is lethal to most insects as a contact poison (C use?)

Ref: East African Tobacco Company Limited, 1959, pp. 169-70; East African Trade and Industry, 1963, pp. 26-9; Hanger, 1959, pp. 166-70; Schery, 1952, pp. 301-2; Suttie, 1970, pp. 378-85; Uphof, 1968, pp. 360-1; Willis, 1966, p. 774

124. Ocotea usamborensis (Lauraceae) East African
camphorwood

A tree usually 150 feet tall common to wet montane forests of Rift Valley, Central, and Coast Provinces 4000-8000 feet

Uses:

1. wood - yellow-brown, strong, moderately heavy, 32-40 lb/cu ft air dry, highly resistant to fungi and ants but not to termites; used for furniture (C)
2. wood shavings - yield a highly odorous essential oil used for perfumes and for medicine as a chest rubbing oil (C)

Ref: Dale and Greenway, 1961, p. 243; Willis, 1966, p. 786

125. Oldfieldia somalensis (Euphorbiaceae) African teak
mbauri, mbambara African oak

A tree commonly found in the forest and as a small tree in the savanna of Coast Province

Use:

inner bark - remedy for chest complaints (L)

Ref: Dale and Greenway, 1961, p. 211; Uphof, 1968, p. 372; Willis, 1966, p. 790

126. Olea africana (Oleaceae)

A tree usually 20-30 feet tall, widely spread in evergreen woodlands, woody grasslands, and drier upland forests often associated with Juniperus procera

Use:

wood - very hard, strong, and durable, heavy, 70-74 lb/cu ft air dry, burns well, extremely durable in the ground; used for cabinets, furniture, paneling, turnery, building poles, and fuelwood (C)

Ref: Dale and Greenway, 1961, p. 346; Willis, 1966, p. 790

127. Olea welwitschii (Oleaceae) Elgon olive

A forest tree usually 90 feet tall found in rainforests of Nyanza Province at 4500-6000 feet

Use:

wood - heartwood yellow-brown to pale red-brown with dark streaks, heavy, 49-52 lb/cu ft air dry, very strong, moderately durable, resistant to termites; used for building poles (C)

Ref: Dale and Greenway, 1961, p. 349; Willis, 1968, p. 790

128. Dryza sativa (Gramineae) rice
mpunga

Most likely introduced from Asia centuries ago; a crop which does not survive above 5000 feet which prefers high temperatures and either ample rainfall or irrigation water which can be found in low altitudes of Nyanza, Central, and Coast Provinces

Uses:

1. cereal - eaten as whole grains (C)
2. bran after preparation of cereal - cattle feed (C)

Ref: Kaplan, 1967, p. 463; Savile, et. al., 1958, pp. 228-33; Uphof, 1968, pp. 377-8; Willis, 1966, pp. 810-1

129. Parkia filicoidea (Leguminosae) fernleafed nitta
mnienzi, mkunde tree
locust bean tree

A tree commonly found in Kwale and Mombasa Districts, Coast Province

Uses:

1. bark - red-brown dye (L); tannin, 14% (L)
2. seed (powdered) - flavoring for native dishes and soups (L)

Ref: Dale and Greenway, 1961, p. 305; Hill, 1952, p. 347; Uphof, 1968, p. 388; Willis, 1966, p. 385

130. Parthenium argentatum (Compositae) guayule

A crop noted as having been introduced

Use:

entire plant - latex for rubber (RC - noted as having been introduced but no further data is available)

Ref: Hill, 1952, pp. 143-4; Schery, 1952, pp. 197-8; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 389

131. Passiflora edulis (Passifloraceae) passion fruit

A vine bearing juicy aromatic fruit similar in appearance to a small gourd; native to the Americas; cultivated in Southern, and Central Provinces around 6000 feet where rainfall is at least 52 inches per annum

Use:

fruit - eaten as is or made into a juice (E)

Ref: Farming Correspondent, 1968, p. 34; Kenya Government, 1965, (Map); Chapman, 1963, pp. 165-8; Suttie, 1970, pp. 378-85; Uphof, 1968, p. 390; Willis, 1966, p. 837

132. Pelargonium spp. (Geraniaceae) geranium oil

Native to South America; grows well in a warm, dry, climate; propagated from stem cuttings and persists for 3-4 years; usually grown by European farmers but some effort is being made in the Embu District,

Central Province for native cultivation

Use:

foliage - essential oil is distilled from the foliage which is used for perfume (E)

Ref: Cobley, 1956, pp. 329-31; East African Trade and Industry, 1961, p. 21; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 390; Willis, 1966, p. 837

133. Pennisetum typhoides (Gramineae) bulrush millet
maweile

Probably native to Africa; tolerates poor soils and less than 40 inches of rainfall per annum; is grown at altitudes of 0-5000 feet; is one of the traditional food crops of Kenyans but presently is being replaced with maize because of excessive bird damage in the field and difficulty in home preparation compared to maize

Uses:

1. cereal - human starch source in the diet (C)
2. stalks - good forage crop for domestic animals (L)

Ref: Dowker, 1963, p. 52; Savile, et. al., 1958, pp. 228-33; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 395; Willis, 1966, p. 844

134. Persea americana (Lauraceae) avocado

A tree native to Central America and the West Indies

Use:

fruit - usually eaten as is by Europeans with salt and pepper or mixed with sweeter fruits in a salad (C)

Ref: Suttie, 1970, pp. 372-85; Uphof, 1968, p. 397; Williamson, 1955, p. 93; Willis, 1966, p. 853

135. Phaseolus aureus (Leguminosae) gram
(syn. P. mungo)

An annual herb cultivated throughout Kenya; probably native to India; one of the original food crops of Kenyans

Use:

seed - dried and cooked as a vegetable (C)

Ref: Schery, 1952, p. 402; Suttie, 1970, pp. 372-85;
Uphof, 1968, p. 400; Willis, 1966, p. 861

136. Phaseolus coccineus (Leguminosae) butter bean

A cultivated bean native to South America

Use:

seed - cooked as a vegetable (C)

Ref: Cobley, 1956, p. 144; Suttie, 1970, pp. 372-85;
Uphof, 1968, p. 397; Williamson, 1955, p. 93; Willis,
1966, p. 853

137. Phaseolus vulgaris (Leguminosae) kidney bean
green bean
dried bean

A low bush or vine native to tropical America which
was introduced to tropical Africa by the Portu-
guese

Use:

seed - dried and cooked as a vegetable in the form
of kidney or dried beans or cooked whole as a
green vegetable as the common green bean (C)

Ref: Suttie, 1970, pp. 372-85; Uphof, 1968, p. 400;
Willis, 1966, p. 861

138. Phoenix reclinata (Palmae) wild date palm
mkindu

A palm found from 0-10,000 feet

Uses:

1. leaf - fibrous, made into baskets and mats
(L)
2. root - brown dye (L)

Ref: Dale and Greenway, 1961, p. 12; Willis, 1966, p.
866

139. Phormium tenax (Agavaceae) New Zealand flax

Native to New Zealand; related to agave; needs a
little or no attention in cultivation; it is the
only hard fiber not obtained from a tropical spe-
cies on a commercial scale

Use:

leaf fiber - used for tow lines, twine, and cordage (C)

Ref: Hill, 1952, p. 38; Uphof, 1968, p. 402; Willis, 1966, p. 866

140. Phyllanthus discordeus (Euphorbiaceae)

A tree commonly found in Coast, Central, Rift Valley, and Nyanza Provinces in thickets of the savanna and on forest-edge

Use:

wood - brown to pale red, hard and heavy, burns well; used for cabinets and fuelwood (C)

Ref: Dale and Greenway, 1961, p. 212; Willis, 1966, p. 869

141. Phyllanthus floribundus (Euphorbiaceae)

A tree commonly found in the littoral zone of Coast Province

Use:

bark - black dye used to blacken and preserve fishing nets (L)

Ref: Dale and Greenway, 1961, p. 215; Willis, 1966, p. 869

142. Piaqgiaea demartiniana (Apocynaceae)

A tree usually 25 feet tall common to dry low country of Northern Province

Use:

wood - very hard; used for shoes and fuelwood (branches) (L)

Ref: Dale and Greenway, 1961, p. 48; Willis, 1966, p. 874

143. Piliostigma thonningii (Leguminosae) camel's foot leaf tree

A tree found in wet savanna from 0-6000 feet in Coast, Rift Valley, and Nyanza Provinces

Uses:

1. bark and root - tannin, 18% (L)
2. root (mascerated) - red dye (L)
3. pod and seed - blue dye (L)

Ref: Dale and Greenway, 1961, p. 107; Willis, 1966, p. 877

144. Pinus patula (Pinaceae)

Introduced recently into the highlands

Use:

bark - tannin of high quality, 16% (RC)

Ref: Sykes and Simon, 1954, pp. 59-65; Willis, 1966, p. 879

145. Pinus radiata (Pinaceae) radiate pine

A tree native to California and Mexico introduced to the highlands as a plantation crop for tannin and timber

Uses:

1. bark - tannin of high quality, 16% (RC)
2. wood - white with a pinkish tinge, low resistance to decay and termite attack; used for flooring, cabinets, furniture, shelving, matches, and plywood (C)

Ref: Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 410; Willis, 1966, p. 879

146. Pinus sylvestris (Pinaceae) Scotch pine
scots pine

A tree introduced from Europe to the highlands as a plantation timber crop

Use:

wood - soft, not strong, durable; used for furniture, shelving, and other general carpentry (C)

Ref: Gleason and Cronquist, 1967, p. 28; Pritchard, 1963, p. 41; Uphof, 1968, p. 410; Willis, 1966, p. 880

147. Piper betel (Piperaceae) betel
(alt. sp. P. betle)

Probably native to Eastern Asia or the Pacific Islands

Use:

leaf - masticatory when mixed with the nut of the
Areca palm (C)

Ref: Schery, 1952, p. 287; Suttie, 1970, pp. 372-85;
Uphof, 1968, p. 411; Willis, 1966, p. 881

148. Podocarpus gracilior (Podocarpaceae) East African
yellow-wood
podo

A tree usually 100 feet tall which is widely distributed in the drier highland forests from 4000-9000 feet

Use:

wood - creamy white to pale brown, clean colored, easily impregnated, odorless and tasteless, soft and light, 31 lb/cu ft air dry, resistant to acids; used for paneling, bakery boards, food cases, cupboards, battery separators, and plywood (E)

Ref: Dale and Greenway, 1961, p. 5; FAO, 1966, p. 18;
Willis, 1966, p. 900

149. Podocarpus milanjianus (Podocarpaceae) East African
yellow-wood
podo

A tree usually 100 feet tall which is widely distributed in the wetter highland forests from 7000-10,000 feet

Use:

wood - same as P. gracilior except the wood is slightly darker in color; used for the same purposes as P. gracilior (C)

Ref: Dale and Greenway, 1961, p. 5; FAO, 1966, p. 18;
Willis, 1966, p. 900

150. Polyscias kikuyensis (Araliaceae)

A tree usually 80 feet tall commonly found in wet highland forests 5000-8000 feet

119
(C)

Use:

wood - white, odorless, soft and light, 22-26 lb/cu ft air dry; used for boxes (C)

Ref: Dale and Greenway, 1961, p. 55; Willis, 1966, p. 910

151. Populus ilicifolia (Salicaceae) Tana River poplar

A tree usually 80 feet tall common to riversides from sea level to 3500 feet

Use:

wood - dark brown, seasons well, light, 25 lb/cu ft air dry; used for dugout canoes (L)

Ref: Dale and Greenway, 1961, p. 493; Willis, 1966, p. 913

152. Premna angolensis (Verbenaceae)

A tree usually 70 feet tall found on forest-edge or in forests of North Nyanza District and Kakamega Forest of Nyanza Province

Use:

wood - yellow-brown, sweet scented, moderately heavy, 48 lb/cu ft air dry; used for furniture, and carvings (C)

Ref: Dale and Greenway, 1961, p. 589; Willis, 1966, p. 918

153. Psidium quajava (Myrtaceae) common guava
mpera

Native to lowland Brazil

Use:

fruit - eaten as is; excellent for its vitamin C (C)

Ref: Cobley, 1956, p. 287; Inter-Territorial Language Committee, 1963, p. 297; Schery, 1952, p. 495; Uphof, 1968, p. 433; Willis, 1966, p. 931

154. Pterocarpus angolensis (Leguminosae) bloodwood

A small to medium-sized tree widely distributed in dry forests of East Africa

Use:

wood - red, very hard, easy to work; used for plywood, furniture, motors, drums, canoes, and spears (C)

Ref: Rendle, 1969, pp. 144-5; Thonner, 1962, p. 273; Uphof, 1968, p. 434; Williamson, 1955, p. 376; Willis, 1966, p. 936

155. Punica granatum (Punicaceae) common pomegranate
mkomamanga

Introduced from Asia

Uses:

1. fruit rind - contains a possible tannin or a triterpene which may be the active principle in its use as an anthelmintic against tape-worm (L)
2. bark of stem and root - contains isopelletierine an alkaloid which may be the active principle in its use as an anthelmintic (L)
3. fruit - eaten as is (L)

Ref: Farming Correspondent, 1968, p. 34; Inter-Territorial Language Committee, 1963, p. 286; Schery, 1952, p. 292; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 436; Willis, 1966, p. 941

156. Pygeum africanum (Rosaceae)

A tree usually 120 feet tall growing in the forests of the highlands above 5000 feet and where rainfall is in excess of 40 inches per annum

Use:

wood - heartwood pale red, not durable in ground, moderately strong and heavy, 45-48 lb/cu ft air dry; used for heavy construction, strong furniture, window frames and door frames (C)

Ref: Dale and Greenway, 1961, p. 406; Uphof, 1968, p. 437; Willis, 1966, p. 943

157. Rapanea rhododendroides (Myrsinaceae) rapanea

A tree found in montane forests, 4500-9000 feet

Use:

fruit - contains a substance with astringent properties which is the most likely active principle in its use as an anthelmintic (L)

Ref: Dale and Greenway, 1961, p. 332; Willis, 1966, p. 952

158. Raphia ruffia (Palmae) raffia palm
(syn. R. Pedunculata)
mwaale

A palm found in Coast and Central Provinces especially in wet areas

Use:

leaf fiber - used for woven materials and cordage (L)

Ref: Dale and Greenway, 1961, p. 13; Hill, 1952, p. 45; Uphof, 1968, p. 443; Willis, 1966, p. 953

159. Rhizophora mucronata (Rhizophoraceae) mangrove
mkoko, mkaka

A tree usually 80 feet tall found in mangrove swamps of Coast Province

Uses:

1. bark - tannin, 30-40%, used for thick, red, leathers made into conveyer belts and for other industrial purposes (E); red dye (L)
2. wood - very durable; used for building poles (C)

Ref: Dale and Greenway, 1961, p. 399; Inter-Territorial Language Committee, 1963, p. 303; Sykes and Simon, 1954, pp. 59-65; Uphof, 1968, p. 449; Willis, 1966, p. 965

160. Ricinus communis (Euphorbiaceae) castor bean
mbono, mbarika

Likely to be native to tropical Africa; is produced in the drier areas of Southern Province usually on small scale from wild plants - insect pests often make production on a large scale uneconomical although research is being done to alleviate this problem; the crop has a wide altitude range and moderate rainfall requirements

Uses:

1. seed - pressed for a valuable nondrying oil used for medicine as a laxative and to rid of warts (active principle - ricinoleic acid, an unsaturated fatty acid) and for protective coating, insulation, and food containers; hydrated form of the oil makes an excellent drying oil used for paint, lubricants, varnish, soap, ink plastics, illuminants, and for leather preservative (E)
2. presscake - used for fertilizer but is toxic to cattle (C)

3. leaf - yields an insecticide (C)
4. stem - fibrous, made into cardboard, wall boarding, and newsprint (C)

Ref: Cobley, 1956, pp. 113-6; East African Trade and Industry, 1963, pp. 26-9; Hill, 1952, pp. 200-1; Inter-Territorial Language Committee, 1963, p. 269; McIlroy, 1963, p. 77; Savile and Wright, 1958, pp. 1-9; Schery, 1952, p. 315; Suttie, 1970, pp. 372-85; Uphof, 1968, pp. 452-3; Willis, 1966, p. 792

161. Rinorea poggei (Violaceae)

A tree usually 20 feet tall in the understory of Kakamega and Nandi Forests of Nyanza Province

Use:

wood - durable; used for building poles, walking sticks, and knobkerries (L)

Ref: Dale and Greenway, 1961, p. 601; Willis, 1966 p. 973

162. Rosmarinus officinalis (Labiatae) rosemary

Native to the Mediterranean area

Use:

inflorescence - distilled for an essential oil used in cheap perfumes, hair washes, and soaps (C)

Ref: Schery, 1952, p. 256; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 455; Willis, 1966, p. 980

163. Saccharum officinalis (Gramineae) sugar cane
(alt. sp. S. officinale)

Probably native to the Far East; 14-18 months before the first harvest; can be cut for three seasons from one planting; grows best where there is an even distribution of rainfall about 25-100 inches per annum; usually planted near Lake Victoria, Nyanza Province and Coast Province often as part of resettlement schemes

Uses:

1. juice from canes - made into sugar and molassas (C) or as an alternate simpler method, into jaggery, a local product (L)

2. fibrous part of stem (after extraction of juices) - used for production of paper, artificial silk, fiber boards, cattle feed, or fuel for running the mill (C)

Ref: Barnes, 1953, pp. 355-8; Ensoll, 1970, pp. 40 and 46; Farming Correspondent, 1968, p. 34; Gill, 1959, pp. 164-7; Hanger, 1959, pp. 164-6; Kaplan, et. al., 1967, p. 463; Schery, 1952, p. 463; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 463; Willis, 1966, p. 991

164. Salvadora persica (Salvadoraceae) toothbrush tree
mswaki

A tree commonly found in Coast, Southern, and Northern Provinces

Use: ✓
twig - toothbrush (L)

Ref: Dale and Greenway, 1961, p. 496; Uphof, 1968, p. 466; Willis, 1966, p. 966

165. Schizogygia coffaeoides (Apocynaceae)
mwango, mpelepele

A tree commonly found in Coast Province

Use:
root - remedy for skin diseased when used along with coconut oil (L)

Ref: Dale and Greenway, 1961, p. 49; Willis, 1966, p. 1014

166. Sesamum indicum (Pedaliaceae) sesame
(syn. S. orientale) simsim
ufuta

Probably native to Africa; harvesting usually done by hand; grown mostly in Nyanza Province; the yield of one crop is only one-third that of groundnuts therefore where groundnuts can be grown as easily as sesame the former is chosen

Uses:
1. seed - pressed for an edible semi-drying oil used for cooking or salad oil or for soap, perfume, rubber substitutes, or as a powerful synergist with pyrethrum in insecticides

- (E); whole, used for topping on bakery (C)
 2. presscake (the part remaining after removal of the oil) - fertilizer (C)

Ref: Cogley, 1956, pp. 103-6; Hill, 1947, pp. 146-9; Savile and Wright, 1958, pp. 1-8; Schery, 1952, pp. 265, 299, and 327; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 481; Willis, 1966, p. 1035

167. Sida carpinifolia (Malvaceae)
 mfagio

Origin uncertain but is a widespread weed

Use:

stem fiber - made into brooms (L)

Ref: Inter-Territorial Language Committee, 1963, p. 275; Williamson, 1955, p. 108; Willis, 1966, p. 1038

168. Solanum tuberosum (Solanaceae) Irish potato
 ziazi zya ulaya

Probably introduced by missionaries; not earlier than the late nineteenth century; grown usually in the cool highlands, 2000-7000 feet; ready for harvest after four to five months

Use:

underground tuber - source of starch in the diet (C)

Ref: Savile and Wright, 1958, pp. 128; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 491; Willis, 1966, p. 1048

169. Sonneratia sp. (Sonneratiaceae)

A tree commonly found in mangrove swamps of Coast Province

Uses:

1. bark - tannin, 15% (L)
2. leaf - camel fodder (L)

Ref: Dale and Greenway, 1961, p. 539; Willis, 1966, p. 1050

170. Sorghum bicolor (Gramineae) sorghum
 mtama

Probably native to Africa; requires similar soil

conditions to maize but will withstand heat and drought better; roughly equivalent to maize in feeding value but is superior to rice and second only to wheat in food value; because of its extreme susceptibility to bird damage in the field and the long preparation in getting it ready for human consumption, the crop has been replaced with maize wherever possible; it was one of the original food crops of Kenyans

Use:

cereal - a staple food for Africans normally ground into meal or flour and then eaten in the form of a porridge or batter (C); used as live-stock or poultry feed (L)

Ref: Dowker, 1963, pp. 52-7; McIlroy, 1963, pp. 130-3; Savile, et. al., 1958, pp. 1-9; Schery, 1952, pp. 393-4; Suttie, 1970, pp. 372-85; Willis, 1966, p. 1052

171. Spirostachys africana (Euphorbiaceae)
msarakana

A tree usually 40 feet tall found in Coast and Northern Provinces

Use:

wood - brown with handsome dark markings, very fragrant; used for fancy small articles (C)

Ref: Dale and Greenway, 1961, p. 220; Willis, 1966, p. 1061

172. Strophanthus kombe (Apocynaceae) strophanthin

A perennial climber found growing in wooded areas of tropical Africa including Kenya

Use:

seed - contains strophanthocide and cymoral which may be the active principle in its use as a cardiac stimulant (RC); arrow poison (L)

Ref: Dale and Greenway, 1961, p. 42; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 502; Willis, 1966, p. 1083

173. Tamarindus indica (Leguminosae) tamarind
mkwaju, msisi

A tree found in Southern, Northern, and Nyanza

Provinces from sea level to 4500 feet in the savanna

Uses:

1. wood - burns well; used for charcoal (C)
2. fruit - ripe, can be made into a pleasant cooling drink useful as a laxative or a remedy for fevers or as a fruit drink (L); over-ripe, used to clean copper or brass (L)

Ref: Dale and Greenway, 1961, p. 109; Inter-Territorial Language Committee, 1963, p. 289; Uphof, 1968, p. 510; Willis, 1966, p. 1099

174. Telfairia pedata (Cucurbitaceae) Zanzibar oil vine
mkueme

A climbing plant most likely native to tropical Africa

Use:

- seed - may be pressed for a nondrying oil usable for soap making (C)

Ref: Dalziel, 1948, p. 63; Inter-Territorial Language Committee, 1963, p. 289; Irvine, 1961, pp. 89-90; Uphof, 1968, p. 513; Williamson, 1955, p. 116; Willis, 1966, p. 1105

175. Tephrosia vogelii (Leguminosae) tephrosia
mtupa, kibaazi

A tree found in Coast Province and Trans Nzoia District of Rift Valley Province

Uses:

1. leaf - picicide and insecticide (L)
2. entire plant - grown as green manure or a cover crop (L)

Ref: Dale and Greenway, 1961, p. 378; Uphof, 1968, p. 514; Willis, 1966, p. 1106

176. Terminalia chebula (Combretaceae)

A tree recently introduced from India on a very small scale as a research crop

Use:

- fruit - tannin, 20% (RC)

Ref: Sykes and Simon, 1954, p. 63; Uphof, 1968, p. 515;
Willis, 1966, p. 1106

177. Thespesia danis (Malvaceae)

A tree commonly found in Coast Province; usually found in savanna approximately 15 feet tall

Use:

wood - red, hard and durable; used for bows (L)

Ref: Dale and Greenway, 1961, p. 263; Willis, 1966, p. 1118

178. Thespesia populnea (Malvaceae) tulip tree

A tree or shrub usually 30 feet tall found growing on saline sands in Coast Province

Uses:

1. wood - durable in ground and water; used for cabinets and boats (C)
2. stem fiber (bast) - local cordage (L)

Ref: Dale and Greenway, 1961, p. 263; Uphof, 1968, p. 518; Willis, 1966, p. 1118

179. Trachylobium verrucosum (Leguminosae) gum copal
msandarusi, mtandarusi, mnyanza

A tree found in Kwale and Kilifi Districts, Coast Province in mixed evergreen forest

Uses:

1. wood - heartwood pale to dark red-brown with a marked striped figure, hard and heavy, 50-60 lb/cu ft air dry, not durable in ground but resistant to marine borers; used for door and door frames and very likely for boats (C)
2. stem exudate - resin (copal), incorporated into high grade varnish (RC)

Ref: Dale and Greenway, 1961, p. 109; Hill, 1952, p. 154; Uphof, 1968, p. 523; Willis, 1966, p. 1133

180. Trema guineensis (Ulmaceae)
mpesi

A tree, widely distributed in the wetter parts

from the Coast to 6000 feet; very common in secondary forest and on forest edge

Use:

leaf - remedy for coughs when mixed with lemon juice (L)

Ref: Dale and Greenway, 1961, p. 577; Inter-Territorial Language Committee, 1963, p. 303; Uphof, 1968, p. 523; Williamson, 1955, p. 119; Willis, 1966, p. 1135

181. Trichilia emetica (Meliaceae) bitterwood
mti maji, mnuwaji, mnuwamai, mti-mai

A tree found in Kakamega Forest, Nyanza Province at 5500 feet

Use:

seed - pressed for a nondrying oil, may be poisonous used for soap and ointments (C?)

Ref: Dale and Greenway, 1961, p. 270; Inter-Territorial Language Committee, 1963, p. 309; Uphof, 1968, p. 524; Willis, 1966, p. 1139

182. Triticum aestivum (Gramineae) common wheat
ngano

A major cereal crop of the highlands probably introduced from Europe only recently; usually grown from 6000-9000 feet in Rift Valley and Central Provinces

Uses:

1. cereal - ground into meal or flour (C)
2. straw - used for litter, bedding, or mulching (L)

Ref: Kaplan, et. al., 1967, p. 464; Savile, et. al., 1958, pp. 232-3; Schery, 1952, pp. 372-81; Suttie, 1970, p. 378; Uphof, 1968, pp. 527-8; Willis, 1966, p. 451

183. Urena lobata (Malvaceae) candillo
mchokochore jike

A common weed in all of the tropics

Use:

stem fiber (bast) - used for ropes, is said to be more lasting than jute, ropes are resistant

to termites and water (L)

Ref: Hill, 1952, p. 34; Inter-Territorial Language Committee, 1963, p. 272; Uphof, 1968, p. 535; Williamson, 1955, p. 121; Willis, 1966, p. 1166

184. Vanqueria edulis (Rubiaceae) medlor
(syn. V. madagascariensis)
mviru

Use:

fruit - eaten as is having a sweetish-acid taste; must be eaten when over-ripe (L)

Ref: Inter-Territorial Language Committee, 1963, p. 316; Uphof, 1968, p. 538; Willis, 1966, p. 1172

185. Vetiveria zizanoides (Gramineae) vetiver

Native to India but found growing wild in many parts of East Africa

Uses:

1. root - distillation yields an essential oil used for perfume (C)
2. entire plant - anti-erosion or forage crop (L)

Ref: Cobley, 1956, p. 343; Hill, 1952, p. 184; Schery, 1952, p. 254; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 542; Willis, 1966, p. 1178

186. Vigna unguiculata (Leguminosae) cow pea

Possibly native to Africa; one of the original food crops of Kenyans highly resistant to drought but not bred for high yield; annual that will produce the year round

Uses:

1. seed - boiled and roasted in various ways for human consumption (C)
2. entire plant - used for domestic animal feed or as an anti-erosion plant (L)

Ref: Cobley, 1956, p. 150; Schery, 1952, p. 404; Suttie, 1970, pp. 372-85; Willis, 1966, p. 1180

187. Voandzeia subterranea (Leguminosae) bombara
mjugu mawe groundnut
congo goober

Most suitable for cultivation in Nyanza and Coast Provinces at altitudes of sea level to 5000 feet

Use:

seed - similar to the common groundnut and can be used for the same purposes in cooking and for an edible oil (C)

Ref: Savile and Wright, 1958, pp. 1-9; Suttie, 1970, pp. 372-85; Uphof, 1968, p. 548; Williamson, 1955, p. 126; Willis, 1966, p. 1185

188. Warburgia ugandensis (Canellaceae)

A tree commonly found in lowland rainforests and upland evergreen forests, 3500-7000 feet

Uses:

1. stem exudate - resin used to fix handles on tools (L)
2. bark, leaf, and fruit - used for flavoring hot curries (L)

Ref: Dale and Greenway, 1961, p. 111; Willis, 1966, p. 1189

189. Zea mays (Gramineae) maize
mahindi corn

Introduced from America by the Portuguese; early in the twentieth century, it surpassed other crops such as sorghum and millet for most Kenyans as a cereal crop; grown all over the country wherever rainfall is adequate; it does not thrive above 7000 feet or in badly drained areas around Lake Victoria

Use:

cereal - staple food for most Africans; pressed for an edible semi-drying oil (embryo of seed only); used for cooking or soap, paint, or for a rubber substitute; whole cereal as a domestic animal feed (C)

Ref: Karani, 1966, pp. 3-10; Miracle, 1966, pp. 3, 109 and 112; Savile, et. al., 1958, pp. 228-9; Uphof, 1968, pp. 561-2; Willis, 1966, p. 1207

APPENDIX

HERBARIA AND BOTANICAL GARDENS WHERE THE PLANTS MAY BE FURTHER STUDIED

This list of botanical collection centers is intended to be a reference for the location of specimens either living or dried of the plants mentioned in this thesis. It is divided into four arbitrary categories for convenience: (1) Timber and Forest Products, (2) Medicinal, Aromatic, and Insecticidal Plants, (3) Economic Plants of East Africa, and (4) Flora of Tropical Africa. The list is compiled from The International Directory of Botanical Gardens (Howard, Wagenknecht, and Green, 1963) and Index Herbariorum Part 1, The Herbaria of the World (Lanjouw and Stafleu, 1959). In addition, special reference to Kenya agriculture is taken from The East African Agricultural and Forestry Journal edited by Jones. The list is alphabetically arranged by cities where the centers are located.

1. Timber and Forest Products

Adelaide: Waite Agricultural Research Institute,
(ADW). Private Mail Bag 1, Adelaide, South
Australia - Herbarium and Botanical Gardens

Special Relevance (SR) - plants of economic im-
portance in Southern Australia especially Euca-
lyptus

Axleburg: Forest Products Research Laboratory,
(FPRL), Princes, Risborough, Axleburg, Bucks,
Great Britain - Herbarium

SR - timbers of East Africa

Entebbe: Forest Department, (ENT), P.O. Box 31,
Entebbe, Uganda - Herbarium and Botanical Gardens

SR - woody species of Central Africa

Kikuyu: East African Agriculture and Forestry Re-
search Organization, P.O. Box 21, Kikuyu, Kenya,
East Africa - Forest Plantation Plots

SR - Eucalyptus and Pinus

Oxford: Forest Herbarium, Department of Forestry,
Imperial Forestry Institute, University of Oxford,
(FHO), Great Britain - Herbarium and Botanical
Gardens

SR - woody genera of Tropical Africa especially for
timber and ecologically important trees and shrubs

2. Medicinal, Aromatic and Insecticidal Plants

Boston: Massachusetts College of Pharmacy (MCP),
179 Longwood Ave., Boston, 15, Massachusetts,
U.S.A. - Herbarium

SR - world-wide emphasis on medicinal, aromatic,
insecticidal, and allergenic plants

Köln-Merheim: Gartenbau - Abteilung, Dr. Madaus and
Company, Köln-Merheim, Germany - Botanical Gardens

SR - medicinal plants

Paris: Jardin Botanique de la Faculte de Pharmacie,
4 Avenue de l'Observatoire, Paris 6^e, France -
Botanical Gardens

SR - medicinal plants

3. Economic Plants of East Africa

Aswan: The Plant Garden, Aswan, Egypt, U.A.R. -
Botanical Gardens

SR - tropical plants of economic value

Brignales: Salgues Foundation of Brignales for the
Development of Biological Sciences, (SFB), Brignales
(Voi), France - Herbarium

SR - materials of possible economic value for
medicine and industry

Brooklyn: Brooklyn Botanic Garden and Arboretum,
Administration Building, 1000 Washington Avenue,
Brooklyn 25, New York, U.S.A. - Botanical Gardens

SR - tropical economic plants

Cairo: The Agricultural Museum, (CAIM), Ministry of
Agriculture, Dokki, Giza, Cairo, Egypt, U.A.R. -
Herbarium

SR - economic and desert plants

Cambridge: Economic Herbarium of Oakes Ames, Botan-
ical Museum of Harvard University, (ECON), Cambridge,
Massachusetts, U.S.A. - Herbarium

SR - plants useful or harmful to man

Chicago: Chicago Natural History Museum (F),
Rooseveltdt Road and Lake Shore Drive, Chicago 5,
Illinois, U.S.A. - Herbarium

SR - world-wide tropical woods and economic plants

Delft: Cultuurtuin voor Technische Gewassen, 1,
Julianalaan 67, Delft, Netherlands - Botanical Gar-
dens

SR - economic plants

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Entebbe: Entebbe Botanic Gardens, P.O. Box 40,
Entebbe, Uganda - Botanical Gardens

SR - tropical economic plants

Havana: Estracion Experimental Agronomica, (SV),
Santiago de la Vegas, Havana, Cuba - Herbarium
and Arboretum

SR - world-wide economic plants

Nairobi: Department of Agriculture, Nairobi, Kenya -
Research Stations in Kenya

SR - has compiled a checklist of crops in the crop
introduction section of the Department of Agriculture (Suttie)

Nairobi: East African Agricultural and Forestry
Research Organization, P.O. Box 30148, Nairobi,
Kenya - Research and Publications

SR - publishes the East African Agricultural and
Forestry Journal

Nairobi: The East African Herbarium (Incorporating
the Amani Herbarium of the East African Agriculture
and Forestry Research Organization and the Coryndon
Museum Herbarium), (EA), P.O. Box 566, Nairobi,
Kenya, East Africa - Herbarium

SR - East African Flora, native economic plants of
East Africa, grasses and pasture plants of East
Africa

New Delhi: Division of Botany, Indian Agricultural
Research Institute, (IARI), New Delhi (12), India -
Herbarium and a small Botanical Garden

SR - economic botany

Saharanus: Governmental Horticultural Research Insti-
tute, Saharanus, Uttas Pradesh, India - Botanical
Gardens

SR - tropical and subtropical fruits

4. Flora of Tropical Africa

Berlin: Botanisches Museum, (B), Königin Luise

Strasse 6-8, Berlin-Dahlem, Germany - Herbarium

SR - Tropical Africa

Bruxelles: Jardin Botanique de l'Etat, (BR), 236
Rue Royale, Bruxelles, Belgium - Herbarium

SR - Tropical Africa

Bruxelles: Laboratoire de Botanique Systematique
et de Phytogeographie, (BRLU), 28 Avenue Heger,
Bruxelles, Belgium - Herbarium

SR - African Flora

Cairo: The Desert Institute, (CAIH), Mataria, Cairo,
Egypt, U.A.R. - Herbarium

SR - arid and semi-arid flora

Entebbe: Forest Department, (ENT), P.O. Box 31,
Entebbe, Uganda - Herbarium and Botanical Garden

SR - woody species of Central Africa

Kampala: Kawanda Research Station, (KAW), P.O. Box
265, Kampala, Uganda - Herbarium

SR - mainly Uganda flora but has some species from
other East African regions as well

Kew: The Herbarium and Library, (K), Royal Botanic
Gardens, Kew, Richmond, Surrey, Great Britain -
Herbarium and Botanical Gardens

SR - Flora of Tropical East Africa

London: British Museum (Natural History), (BM),
Cromwell Road, London, S.W. 7, Great Britain -
Herbarium

SR - East African Flora

Nairobi: The East African Herbarium, (EA), P.O.
Box 566, Nairobi, Kenya, East Africa - Herbarium

SR - East African Flora, native economic plants of
East Africa, grasses and pasture plants of East
Africa

Nairobi: Nairobi Arboretum Forest Reserve, the Chief

Conservator of Forests, Forest Department, P.O.
Box 30027, Nairobi, Kenya, East Africa - Botanical
Gardens

SR - plantation of indigenous hardwoods, aloe and
euphorbia

Oxford: Fielding Herbarium, Druce Herbarium, Depart-
ment of Botany, (OXF), Oxford, Great Britain -
Herbarium

SR - African Flora

Salisbury: University College of Rhodesia and Nyasa-
land, (CAH), Private Bag 167H, Salisbury, South
Rhodesia - Herbarium and Experimental Botanical
Garden

SR - Tropical African Flora; African mountains

St. Louis: Missouri Botanical Gardens, (MO), 2315
Tower Grove Avenue, St. Louis, 10, Missouri, U.S.A.-
Herbarium and Botanical Garden

SR - Tropical Africa

Syracuse: Herbarium of the Department of Plant Sci-
ences, (SYR), Syracuse University, Syracuse, New
York, U.S.A. - Herbarium

SR - Tropical Africa

Wageningen: Laboratory for Plant Taxonomy and Plant
Geography, (WAG), 37 General Faulkesweg, Wageningen,
Netherlands - Gerbarium

SR - African Flora

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