PEOPLE AND PLANTS: A SURVEY OF ECONOMIC BOTANICALS ON THE KUMASI CENTRAL MARKET

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ABSTRACT

Plants generally provide valuable functions in livelihood sustenance and indigenous knowledge on their utilization has been applied over centuries. However society's dependence on plant resources is threatened by rising environmental degradation especially in the tropics and the associated loss of indigenous botanical knowledge cannot be underscored. Traditional markets are useful sources on information on plants. This paper reports on the ethno botany, availability and consumption trends of economic plants sold on the Kumasi Central market in the Ashanti Region of Ghana, as well as challenges encountered in marketing these resources. Structured questionnaire and inventory sheets were employed in a detailed documentation of information on the vendors and their products. Photographs of the products and specimens were also gathered, prepared and preserved in a herbarium at the Forestry Resarch Institute of Ghana. Information on 150 plant species belonging to 55 families was documented along with a taxonomic identification of new species. Nearly all plant species had multiple uses with approximately 57% and 20% used for medicinal and food purposes respectively. Ninety-seven percent of the plants were non-timber forest products collected from the wild, and 30% of these were reported to have declined in supply as a result of degradation of vegetation. Demand has increased for 60% of the products, attributable to increased recognition and values that consumers currently attach to natural products mainly for medicinal and food purposes. With rising demand and declining supply of some plant species, the sustainability of the natural resource base is possibly threatened. This is because the sources from which these prodcuts are collected are usually unmanaged and harvesting methods, although rudimentary, may be destructive. Management interventions that would enable sustained exploitation of plant species collected from the wild, as well as the development of cultivation methods for key threatened species are imperative to aid biodiversity conservation and sustain the livelihoods of people relying on these resources for survival.

Keywords: Non-wood forest products, natural plant marketing, ethno botany, indigenous knowledge

INTRODUCTION

Natural plants or botanicals globally play a key role in the sustenance of livelihoods of people providing income, employment, food and medicines among others. The global market value for natural plant products stands at \$65 billion and growing steadily (FRAME, 2006). It is estimated that approximately one billion people living in the tropics make extensive use of essential oils, gums and resins, fungi, fruit, edible oils, roots and other products for subsistence purposes and income generation (Vedeld *et al.*, 2004; Schreckenberg, 2006).

A wide range of botanicals are sold on traditional markets in the tropics. A number of studies on market documentation and trade in these plant resources in West and Central Africa have been

reported (e.g., Sunderland and Obama, 1999; Kimpouni, 1999; Ndoye et. al., 1999). However, in Ghana there is limited comprehensive market documentation on these traditional economic plants, despite their importance in fulfilling livelihood needs to the populace with possibly over 700 people involved in their trade (Falconer, 1990). Burkill (1985) recognized the importance and urgency of documenting, particularly, the economic uses of such plants in Tropical West Africa. Besides it is believed that some of the species and indigenous knowledge on them may be fast disappearing as a result of genetic erosion resulting from increasing environmental/vegetation degradation as well as increasing modern synthetic substitutes for natural products on the market (Höft et al., 1999). Moreover, traditional knowledge on especially utilization of these resources remains largely undocumented, as it is usually handed down orally (Burkil, 1985; RAO, et al., 2004).

Consequently, a study was designed to mainly assess what economic botanical resources or natural plants are marketed or sold on Ghanaian markets and how they are traditionally utilized. The study also assessed their availability and consumption patterns from vendor perspectives, which of the plant species are endangered, i.e., scarce or going into extinction. The study also sought to identify the key challenges that affect the marketing of the botanicals and how these challenges can be addressed to conserve botanical resources, to inform policy decisions as well as sustain the livelihoods of the many rural and urban people who depend on them for survival. This paper reports on the key findings of the study.

METHODOLOGY

Study Site

Kumasi, a Metropolis populated with 1.6 million people (UNUP, 2007) being centrally located in Southern Ghana (Figure 1) is a nodal city linking the southern and northern sectors of the country. The Kumasi Central Market is one of the largest urban open daily markets in Africa and the surrounding business area is one of the busiest economic centres in the country. The area is therefore a wealthy source of information on market plants. According to Nguyen (2005), market places found in cities and towns are rich sources of ethno botanical information and are places of intensive interaction between people (vendors and consumers) and plants.

Traditionally, the natives of Kumasi are the Ashantis. However, being an important economic centre and the second largest city of the country, the Kumasi market is characterized by multi-ethnic groupings from around the country, with some of the people originating from neighbouring countries in the West African Sub-region including Cote d'Ivoire, Mali, Niger, Burkina Faso, Togo and Nigeria.



Figure 1: Map of Ghana showing Kumasi and photo of a section of the Kumasi Central Market

Sampling Procedure, Data Collection and Analysis

A reconnaissance visit was first made to the Kumasi central market to locate vendors in economic botanicals and assess the variety of products being sold to facilitate questionnaire design and data collection. It was observed that the vendors were located at various sections of the market selling a wide array of the botanicals that comprised of non timber forest products mainly. In the context of this paper, non timber forest products refer to economic natural plant materials, woody and non-woody usually gathered from the wild in the forests and farm fallow vegetation but which may also be cultivated. Vendors were first stratified according to the locations. Within each location the vendors were sub-stratified based on major product types i.e. medicines, vegetables, spices and condiments, fruits, handicrafts/artefacts and miscellaneous, Within each product category at least one vendor was sampled purposively for interviewing. The interview was structured to obtain detailed information on products sold and the vendor's level of ethno botanical knowledge.

A total of 16 selected vendors were interviewed. The information collected included personal information on the vendors, plant products traded, constraints and prospects of the trade and suggestions for enhancing the trade. An inventory on the botanicals traded as well as ethno botanical information on their local names, description of the nature of the plant, its ecological source, production/growing area, production method, periods of availability (i.e. seasons and months available), supply and demand trends, form or condition of plant sold, uses, plant part used and preparation methods, was also collected. Photographs of the products were taken along with specimen for preservation at the herbarium at FORIG. The data gathered were analyzed descriptively using the Microsoft Excel.

RESULTS AND DISCUSSION Vendor Characteristics and Organization of the Marketing of Economic Botanicals

The vendors of botanicals on the Kumasi central market are predominantly women over 30 years of age and have been engaged in the trade as their main occupation for 20 years on the average (range 2-40 years) Over 90% the vendors are Ghanaians and the remaining from other countries in the West African Sub-Region, especially Nigeria. The majority (60%) of the vendors have had no formal education with most of the 40% formally educated going up to the primary level. The vendors are mainly retailers, operating from permanent stalls or locations throughout the year. A few of them also undertake wholesaling.

Economic botanicals marketed and indigenous knowledge on their utilization information on products from 150 plant species belonging to 55 families was documented. Majority (87%) of these products was sold as raw plant materials and 13% were manufactured into finished products.

The products have been categorized based on their major uses, although nearly all products have multiple uses. Products documented included medicinal and ritual plants, spices, edible leaves/ vegetables for soup and stews, food/leaf wrappers, toiletries/cosmetics and other body care products including lime/lemon, chew sticks, chew and bath sponges, and so on. Others included gourd products, e.g. such as calabashes, handicrafts (e.g. cane baskets, mats) and several others. The relative proportions of the major use values reported by the vendors are presented in Figure 2. The bulk of the products have medicinal and food use values.



Figure 2: Major use groups of economic botanicals sold at the Kumasi Central Market

Medicinal Products

About 80% of the population of most developing countries employ traditional medicines derived from natural plants for treating human diseases (Rao *et al.*, 2004). Majority (56%) of the plant products documented on the market have medicinal properties for treating various ailments. Most of them have multiple curative properties applied in treating more than one disease condition. Table 1 summarizes the major conditions for which the surveyed plant species are utilized for treatment. Details on the specific medicinal applications of the plant products are presented in Table 2.

Nearly all common human disease conditions and/ or ailments or disorders in the country can be treated by these natural plant medicines. These range from birth related (especially anti and post-natal), skin, intestinal/digestive and respiratory infections, malaria and other fevers including jaundice, aches and pains, cardiac, sexual and nutritional disorders. Others include those for treating piles, hernia, breast lumps, and fractures as well as for coagulating blood, tooth hardening, controlling bed wetting and breast size.

Table 1: Relative proportions of	medicinal plant products sold on the market and health conditions
they treat	

Condition	% Plant products
Birth related (birth control, anti and post natal)	18.3
Sores, boils, rash and infections of the skin, head, mouth,	
ear, nose and eyes	17.2
Digestive disorders (diarrhoea, indigestion) and other	
stomach related conditions	10.8
Malaria, jaundice and other fevers	10.4
Aches and pain (general body/head, waist, tooth, etc.)	8.6
Respiratory (asthma, catarrh/cold and cough)	7.8
Sexually Transmitted Diseases (STD)	4.1
Blood tonics/purifiers	3.7
Laxative/constipation/colon cleansing	3.7
Cardiac/heart related	3.4
Infertility	1.9
Aphrodisiac and other sexual	1.9
Corpse preservation	1.1
Tetanus	1.1
Others	5.6

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major use/Application	Preparation	availability on market	availability
Aframoinum melegue ta	Famwisa	Forest	Fruits	Dried	Mixed with Paullinia pinnata leaves applied to swollen leg	Ground	+	Cultivated
A fram om um gra numpar ad is	A do wa-wisa	Forest	Pod	Dry	Cures pain, ailments and swells due to sprain and blood clot	Seed paste, pod	-	Declined cultivation
Aframomum spp	Apokuo	Savannah (Cultivated)		Dry	Paste applied to painful swollen areas on the body to relieve pain and blood clot e.g. in accident victims	Paste	-	Cultivated
Ageratum conyzoides	Boakuro	Forest Transition	Leaves	Fresh	For curing stomach ailments, enema	Ground and used for enema	-	Environmental degradation
Alchornea cordifolia	Gyamma, Agyamma	Forest Transition	Leaves	Fresh	For curing stomach ailments	Boiled-leaves boiled in water for drinking, boiled with cassava for local meal i.e. fufu	-	Environmental degradation
Anthocleista nobilis	Bontodie, Wudifokete (gynso aduro)	Forest	Bark	Fresh Dried Ground	Used to cure pain in passing urine, Bilharzias, Gonorrhoea and Syphilis and for stopping bed wetting in children at night	Chips of bark added to lime juice and water and boiled for drinking; bark ground and lime juice and water added or ground with ginger and unbroken egg shell for enema	+	Inc rea sed demand
Capsicum frutes cens	Mesewa	Forest Transition Savannah	Fruits	Fresh (green, ripe) Dry	Ground with Alstonea boonei and ginger for enema, cures measles and stomach sores; boiled with other spices for drinking to cure many diseases	Powder, paste/ground	-	Deforestation
Cassia alata	Sempe	Forest Transition	Leaves	Fresh	Treatment of fever	Boiled-leaves boiled in water for drinking	0.00	Environmental degradation
Cassia occidentalis	Nkwadaa, nkwada aborodee	Forest Transition	Leaves	Fresh	Curing fever, jaundice	Boiled-leaves boiled in water for drinking		

Table 2: Ethno-botanical knowledge on major medicinal plants sold on the Kumasi market

¹ Product availability on market: + is equivalent to more, - is equivalent to less, 0 is equivalent to unchanged

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major use/Application	Preparation	Product availability on market	Reasons for availability
Chromolaena ordorata	Acheampong	Forest Transition	Leaves	Fresh	For halting bleeding, e.g. in women	Ground leaves and mixed with water for drinking by bleeding woman	-	Environmental degradation
Chrysophyllum subundum	Adesema/Adasema ayase	Forest	Bark	Dried	Mixed with ginger for enema, boiled with ginger for drinking to cure stomach ailments and sores	l Ground, boiled	1	Deforestation .
Cissus aralioides	Asirimu, Nante- duro, Akwiikwii, Twempoliwa, Kusietomma (Ahafo)	Forest	Stem	Fresh Dry	For stimulating children with weak muscles to walk; Enhance delivery in pregnant women when it is delayed; In Ashanti, elderly wom en apply the paste to their clitoris to stiffen it to enjoy sexual intercourse, young men also apply its powder	Stem ground with ginger for enema in children to enhance walking; stem ground with ginger for enema by pregnant women to enhance delivery; stem ground into paste and applied to clitoris by women. Dry stem pounded and rub	0	Available in the forest
Sector process of					with rub or shea butter to the penis to enjoy and prolong sexual intercourse	or shea butter added and applied to penis by young men		
Citrus aurantiifolia	Ankaatwadee	Forest Transition (Cultivated)	Fruits	Fresh	Raw juice for curing uncasiness in the mouth and throat; juice mixed with other plant medicines applied to boils for fast relief or cure or to facilitate oozing of pus	Juice	-	Dec lined cultivation
Costus afer	Sommebaa	Forest	Leaves	Fresh	Prevent bleeding during pregnancy;	Boiled with palm nuts and pound	+	Inc rea sed
		Transition			ensures healthy babies	for soup		demand
Entada pursa etha	Tata worataa , A tek esere	Forest Transition	Seeds	Dried	Mixed with water and rubbed on boils to treat	Broken into parts, mixed with water	-	Low demand
Entan drophragma angolense	Edinam	Forest	Bark	Fresh Dried	Used for nasal drops for curing severe headaches and sores and phloem in the nose and head	Bark rubbed on stone with water and solution soaked in cotton wool then squeezed into the nostrils in the morning every three days	+	Available in the wild

Table 2 (continued): Ethno-botanical knowledge on major medicinal plants sold on the Kumasi market

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major use/Application	Preparation	Product availability on market	Reasons for availability
Garcinia afzellii	Nsoko-dua, Nsoko	Forest	Stem	Fresh Dry	Hygiene/medicinal-cleaning teeth, 0 mouth cleanser (more effective in clearing mouth than <i>Garcinia kola</i> and <i>Garcinia epunetata</i> , hardens teeth	Cut into pieces for chewing		Deforestation
Garcinia epunetata	N k wan kwa a, N so ko-ak oa	Forest	Stem	Fresh Dry	Hygiene/medicinal-cleaning teeth, mouth cleanser, hardens teeth	Cut into pieces for chewing	-	Deforestation (indiscriminate logging)
Garcinia kola	Tweapea	Forest	Stem	Fresh Dry	Hygiene/medicinal-cleaning teeth, mouth cleanser, hardens teeth, preferred by elderly people because it is harder compared to <i>Garcinia afzellii</i>	Cut into pieces for chewing	-	Deforestation (indiscriminate logging)
Gossypium arboreum	Asaawa, Kunduro (Ash), Asa wa ahaha n	Transition Savannah (Cultivated)	Seeds, leaves	Fresh	For treating hypertension, high blood pressure, stroke	Dried ground fermented, leaves boiled in water for drinking	+	Cultivated
Hilleria latifolia	Anafranaku	Forest Transition	Leaves	Fresh	Prevent bleeding during pregnancy; ensures healthy babies	Ground with ginger for enema	+	Inc rea sed demand
Mareya micrantha	Dobrafo	Forest	Leaves	Dried	Used for family planning and for curing fever and jaundice	For enema-ginger added to dry ground leaves, then lime juice and water added and sieved; Dry leaves also boiled for drinking	+	Inc rea sed demand
Newbouldia laevis	Sosonomasa, sesemasa	Forest Transition	Leaves	Fresh	Prevent bleeding during pregnancy; ensures healthy babies	Boiled with palm nuts and pound for soup	+	Inc rea sed demand
Oc ir num gratissium um	Nunum	Forest	Leaves	Fresh	Cure stomach ailments, used for enema	Boiled- leaves for drinking; ground and used for enema	-	Environmental degradation
Ok uo baka aub revillei	Odii, Odii-aba	Forest Transition	Fruits	Dry	mixed with water and rubbed on boil/pain ful or sore throat, etc.	Whole, solution	-	Deforestation

Table 2 (continued): Ethno-botanical knowledge on major medicinal plants sold on the Kumasi market

A survey of economic botanicals on the Kumasi Central Market

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major use/Application	Preparation	Product availability on market	Reasons for availability
Parkia clappertoniana	Dawadawa	Transition Savannah	Seeds	Fermented seeds	Reduced high blood pressure (cooked in palm nut soup); mixed with other medicinal plants and applied on boils to cure; Empty pods boiled cures stom ach sores in children	Fermented seeds ground into paste-boiled seeds pound to remove husks then covered for 3 days to ferment	0	Available in forest but less during off or farming season
Paullinia pinnata	Toantini	Forest	Root	Fresh Dry	Chewed for curing coughs and chest pains; for healing broken legs or hands	Cut into pieces; grind bark shavings and Aframonum melegueta or Piper guineense and apply to broken area of body	0	Available in forest
Penianthus zenkeri	Kraman-kote	Forest (Swamps)	Stem (un derg rou nd stem)	Fresh Dry	Men use as chew stick to cure impotence and male sexual weakness. It also cures waist pains	Cut into pieces or chips and put in alcohol as bitters		Deforestation
P hyllantus fraternus subsp. Togoensis	Bommaguwakyi	Forest Transition	Roots, leaves	Fresh	Ground roots enhance walking in children; leaves boiled leaves in water is used for treating fever and jaundice	Roots ground for enema; leaves boiled in water for drinking	+	Inc rea sed demand
Piper guineense	Sorowisa	Forest	Fruits	Dried	Mixed with ginger for enema, to cure stomach troubles; piece in stews, soup, maize porridge and ginger drink	Ground	-	Less: deforestation
Psidium guajava	Oguaa, Guava (leaves)	Forest (Cultivated)	Leaves	Fresh	For controlling diarrhoea/running stomach	Boiled-leaves boiled in water for drinking	-	Environmental degradation
Solanum torvum	K wah u nsusaa	Forest Transition	Fruits	Fresh	Blood tonic/purifier-used soups and sauces; enhance appetite in children, pregnant and postnatal mothers; ground raw and mixed with water for drinking to cure fever	Boiled and ground, raw ground	+	Inc rea sed demand
Strophanthus hispidus	Omaatwa, Amanfohoma, Aduropanyini (Ash/Twi)	Forest	Root bark	Fresh Dried	Used as nasal drops for curing chronic headaches and nasal sores/sinuses	Root bark ground into paste with seeds of <i>Aframonum</i> <i>melegueta</i> and liquid squeezed into nostrils	+	Inc rea sed demand

Table 2 (continued): Ethno-botanical knowledge on major medicinal plants sold on the Kumasi market

Table 2 (Continued): Ethno-botanical knowledge on major medicinal products/plants sold on the Kumasi market

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major use/Application	Preparation	Product availability on market	Reasons for availability
Trilepisium madagas cariense	M aenn-twa en n, O kure, M ogy adu ro, K oo ko aduro	Forest	Bark	Fresh Dried, Ground	Used for curing piles, sexual weakness /weak ejaculation in men and infertility in women; used for family planning; used as blood tonic to improve blood supply and purify blood	Chips of bark added to water and boiled for drinking; chips mixed with that of <i>Trilepistum madagascariense</i> , mahogany and <i>Alstonea</i> <i>boonei</i> and added to dry gin as	-1	Deforestation
						bitters		
Xan th oxyl um xant ho xyloides	Oyea, Kanto	Forest	Root bark, twig bark	Dried	Used to heal postnatal sores in the womb after birth and for curing sores in the stomach in general	Chips of bark combined with chips of Morinda lucida, Combretum sp., Park ia clappertoniana, Vitellaria paradoxa, Zingiber officinale and Xylopia aethiopica and boiled together for drinking; concoction used for enema	+	Inc rea sed demand
Zingiber officinale	Akekaduro	Forest	Rhizome	Fresh	For coughs, chest, throat, nose and ear ailments; Mixed with <i>Piper guineense</i> , <i>Xylopia aethiopica</i> , <i>Capsicum</i> <i>frutescens/Ocirnum gratissiumum</i> to stimulate the body and heals sores/ulcers in the stomach. Also used generally as an ingredient in medicines for enemas	Whole, Paste, Powder		Declined cultivation

Food Products

Twenty percent of the plant products have various food uses; the majority (24%) being spices from species such as *Aframonum spp.*, *Cuminum cyminum*, *Syzygium aromaticum*. The other major food products are vegetables from *Corchorus olitorius*, *Talinum triangulare*, *Piper umbellatum*, *Amaranthus spp.* and condiments prepared from *Allium ascalonicum*, *Parkia clappertoniana* and *Irvingia gabonensis* consumed in soup, stews and sauces (Table 3). The various plant parts (leaves, fruits, roots, seeds, bark, etc.) of species and the forms in which they are sold are shown in Table 4.

Some of the food products are additives for flavouring (Renealmia batternbergiana, Tetrapleura tetraptera, Irvingia gabonensis), colouring (Hibiscus cannabinus and Thamatococcus daniellia), thickening (Bombax buonopezense) and softening food (Alchornea cordifolia). Some are also used in the preparation of beverages (Cola nitida) and confectionery (Zingiber officinale). Others are consumed directly as fruits (Dialium guineense, Ananas comosus), chewed as appetizers (Acacia pentagona/ Acacia kamerunensis) or processed into oils (Elaeis guineensis, Vitellaria paradoxa and Irvingia gabonensis), beverages (Tamarindus indica) and meals (Parkia clappertoniana) for consumption.

Food Type % Plant Products Spice 24 Vegetable 17 Condiment 13 Flavour 9 Fruit 9 Colour 7 Oil 7 Thickener 4 2 Beverage 2 Confectionery 2 Meal Softener 2 2 Appetizer

Table 3: Food uses of botanicals sold on the Kumasi Central Market

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Food Type		% Plant Products			
the procedurius are glad use	d av				
Spice			24		
Vegetable			17		
Condiment			13		
Flavour			9		
Fruit			9		
Colour			7		
Oil			7		
Thickener			4		
Beverage			2		
Confectionery			2		
Meal			2		
Softener			2		
Appetizer			2		

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Table 4: Ethno-botanical knowledge on major food plant products on the Kumasi market

Botanical name	Local name	Ecology	Plant part used	Plant condition sold	Major Use/Application	Preparation	Product availability on market	Reasons for the availability
Irvingia gabonensis	Abesebuo	Forest	Pulp, seed/nuts	Dried, Fresh	Rich in edible oil; used in soups	Paste, oil	-	Deforestation
Cucurma domestica	A kekaduro kokoo	Forest, transition	Rhizome	Fresh	Condiment-major ingredient in curry powder	Powder	-	Low demand
Amaran thus spinosos	Aleefi, Aleefu	Forest, transition	Leaves	Fresh	Vegetable used in stew and soups	Boiled and ground	+	In creased cultivation due to high demand
Corchorus olitorius	Ауоуо	Forest, transition	Leaves	Fresh	Vegetable used in soup with o kra	Cut into pieces	+	lincreased cultivation due to high demand
Talinum triangulare	Bogobogo / Bokoboko (Hausa)	Forest, transition	Leaves	Fresh	Vegetable used in stew/sauce	Cut before mixing with agushie stew or palm nut soup	+	lincreased cultivation due to high demand
Xylopia aethiopica	H wen te a	Forest, transition	Fruits	Dried	Spice, medicine	Boiled	+	Available in forest
Cuminum cyminum	N keten kete	Exotic	Fruits	Dried	Seasoning, spice in stews and soups	Ground	0	Available
Syzygiuni aromaticum	Pepre	Exotic	Buds	Dried	Seasoning chicken, fish, etc. spice in stews	Ground		High foreign exchange
Hibiscus cannabinus	Shuurne	Savannah, exotic	Flowers	Dried (purple flowers)	Dye/food colouring-Used for colouring ice cream	Dry flowers	+	High demand
Hibiscus sabdarifa	Shuurne II	Forest, transition	Leaves	Fresh	Vegetable used in soup	Cut into pieces, boiled before added to soup	+	In creased cultivation due to high demand
Bombax buonopozense	Vorga (Mamprusi), A konkodie (Twi)	Transition, savannah	Calyx	Dry calyx	Soup thickener-Used in soup as okra by northern and Moslem communities to thicken and make okra soup slimy	Dried and ground	0	Available in forest but less during farming period
Monod ora myristica	Wedeaba	Forest, transition	Seeds	Dried	Seasoning, spice in stews	Powdered, grated	_	Low demand
Not Identified	Youza	Savannah	Leaves	Dry leaves	Soup thickener	Dried and ground	_	Deforestation
Vitellaria parad oxica,	N kuadu a, Nku aba	Transition, savannah	Nuts	Fresh/ dry	Nuts processed into edible oil and butter for cosmetics	Nuts roasted, pounded or milled and boiled with water for o il extraction		Environmental degradation
Rinorea spp.	Atiagya	Forest	Leaves	Dried	Flavouring palm oil, palm nut soup, etc.	Dry leaves	-	Deforestation

Craft Products

A variety of products crafted or processed from certain plant species were documented. These include calabash, bottle gourd, ornaments, wall hangings, lockets, etc. from *Lagenaria sicerania*; weapons (e.g. bow and arrow) from *Oxytenanthera abyssinica*, strainer or sieve from *Marantochloa leucantha*, baskets from *Elaeis guineensis*, drums from *Vitellaria paradoxa* wood and baskets, trays, flower vases, furniture from *Eremospatha macrocarpa*.

Body Care Products

Some plant species and/or parts thereof are used locally as body care products, i.e. toiletry, cosmetics and jewellery. These include *Citrus aurantiifolia* used as deodorant for refreshing the body and *Momordica spp* used as bath sponge. The dye from *Lawsonia inermis* is a cosmetic used by moslem women for decorating hands and feet during ramadan, weddings and marriage ceremonies. The seeds of *Abrus precatorius* are also used as jewellery e.g. beads, necklaces and rosaries, while those of *Entada pursaetha* are used as lockets or pendants on necklaces.

Ritual Products

Culturally, sponge products from plant species such as *Momordica angustisepala* are important for bathing kings and corpse and also used in fetish shrines. *Dracaena arborea* is planted at the entrance of shrines and cemeteries as a sacred plant; gum from *Daniellia ogea* is burnt as incense, especially when dead bodies are laid in state, in churches and homes to drive away evil/bad spirits, while *Costus afer* is used for driving away evil spirits, epidemics and strange diseases. The nuts from *Cola nitida* is chewed as a stimulant for keeping vigil especially at wake keeping during funerals.

Household Products

Some plant species are also processed into a variety of products for domestic/household cleaning and

cooking purposes. These include brooms for sweeping made from the fronds of *Elaeis* guineensis, fans for fanning fire from *Borassus* aethiopum. Sponges made from *Momordica spp* placed at the base of cooking pots as a protective mesh when boiling staples like yam and cassava. Utensils such as cups for drinking water and beverages (corn porridge, pito, palmwine etc.), containers for storing and transporting shea butter, etc., bowls for serving traditional foods such as banku, akple, omo tuo and laddles for dishing out stew and soups are made from *Lagenaria sicerania*. Others are wooden grinders or crushers and stirrers made from *Milicia excelsa* and *Alstonia boonei* respectively.

Miscellaneous Products

A small proportion (2%) of the plant products documented is used for other miscellaneous purposes ranging from recreation to industrial purposes. For recreation purposes, the seeds of Dioclea reflexa and Caesalpinia bonduc are sold as marbles for playing the traditional "oware" game while musical instruments (e.g. malacas) are made from the gourd plant, Lagenaria sicerania. Dracaena arborea and Dracaena mannii are commonly used for live posts and fences and for marking the boundaries of farms and other landed property. The leaves of Thamatococcus daniellia, Maranthochloa mannii and Maranthochloa cuspidata are used for wrapping food and cola nuts as preservatives. They are also used as fodder for sheep, goats and fowls.

Product Supply Sources

Gatherers, cultivators and middlemen, as well as processors, supply plant products to the market. While almost all products sold (99%) are indigenous and supplied locally, a small proportion (1%) including products such as *Syzygiuni aromaticum* and *Cuminum cyminum* are exotics imported from Nigeria and other countries. There are three main sources of collection of raw or unprocessed plant products. Most of them (83%) are collected from the wild, predominantly from forests and farm fallows, whereas 17% are cultivated. These plant materials are supplied from all the major ecological zones of the country, (Figure 3). The High Forest Zone comprising the wet evergreen, moist and deciduous forests is the major source of supply. Fifty percent of the botanicals are supplied only from this zone whereas 3%, 11% and 1% are supplied only from the forest-savannah transition, guinea savannah and coastal savannah zones respectively. However, 35% of the plant products are supplied from more than one ecological zone with 27% being supplied from the forest and forest-savannah transition zones.



Figure 3: Supply sources (by ecological zone) of botanicals on the Kumasi market



Figure 4: Factors causing increased supply of plant products to the Kumasi market

Product Supply Trends and Factors Influencing Supply

Three major factors generally influence supply of natural plant products to the market. These are seasonality, increased demand or patronage, and environmental or vegetation degradation. The supply of unprocessed plant products is generally irregular due to their seasonal nature, thus such products are scarce on the market during certain times of the year, especially during the dry season.

Supply is increasing for about 47% of the plant products particularly those in medicinal and food use categories. For 87% of these products the rise

in supply is mainly due to increased demand for such products (Figure 4). This is as a result of increasing knowledge about the utilization of these products for medicine and food. In addition they are inexpensive and the number of vendors of these products is increasing. The products which are increasing in supply include *Ficus capensis*, *Ananas comosus*, and *Phyllantus reticulates*. There are several others which include certain medicinal plants such as *Ageratum conyzoides* and *Morinda lucida* believed to be very effective in treating common ailments such as malaria as well as *Combretum sp* used for postnatal restorative cures in women. Despite their high curative potentials, these products are inexpensive and this has brought about increased patronage for them particularly among the urban poor. Other products are increasing in supply due to increased cultivation e.g. *Aframoinum melegueta* and *Dialium guineense* or are easily available in the forest, e.g. *Xylopia aethiopica* and *Monodora myristica*.

Conversely, 45% of the plant products were reported to be declining in supply. For 77% of these products, the decline in supply to the market was attributed to factors related environmental degradation, mainly indiscriminate logging and farming, unlawful cultivation of wetlands and other fragile ecosystems, drought, wildfires and over exploitation of certain plants species collected locally from the wild (Figure 5). These are mainly species of medicinal value but include others that are used for food, chew sticks (e.g. *Garcinia afzeli and Garcinia kola*) and others that are generally used for handicrafts such as rattan (*Eremospatha macrocarpa*).

Others mentioned were Acacia pennata, a chew sponge, Momordica angustisepala used for bath sponge and Piper guineense. According to traders, the extent of depletion of some species such as Garcinia kola is so severe that, its stems or poles are currently, being imported from forest areas of Cote d'Ivoire and Liberia to be split and sold as chew sticks on Ghanaian markets. Other factors reducing the supply of 23% of the products to the market are a decline in demand and cultivation, particularly of hygiene and cosmetic plants as well as the difficulty in harvesting the underground parts of certain medicinal plant species.

Product Demand Trend and Factors Influencing Demand

Demand has increased for 60% of the plant products on the market, declined for 37% and has not changed for 3% of the products. Two major factors influencing these demand trends are the level of utilization and availability of products on the market. The rise in demand is largely caused by increased utilization, whereas the decline in demand is attributable to the reduced importance in utilization of some products (Table 5). Demand has risen for medicinal and food plant products and declined for a range of products for hygiene, food, medicine, leisure and other purposes.

Products for which demand has decreased include Citrus aurantifolia due to numerous modern substitutes (particularly personal hygiene products such as deodorant and sprays) on the market. Incidentally this also has reduced its supply to the market. Other products for which demand has declined as a result of modernization are Aframomum granumparadis, Zingiber officinale, Dioclea reflexa, Thamatococcus daniellia and Momordica spp. In the case of the medicinal plants, the decline in demand is attributed mainly to a shift towards formal medical care as well as a lack of knowledge on the use of some of the plant products, particularly among the younger generation. Similarly, the increasing use of toothpaste for oral hygiene and synthetic seine net for bathing has reduced the demand for chew and bath sponges which, ironically, are also declining in supply. Also, increased use of polythene bags and take away food packs in the sale of cooked food has resulted in a reduction in the demand for the wrapping leaves Thamatococcus daniellia. For some species such as Talinum triangulare, the plant is short-lived and its seeds are difficult to come by, thus it is not readily available on the market. Increasing foreign exchange (i.e. inflation) is also making it expensive to import products from exotic species such as Syzygiuni aromaticum, reducing their supply on the market.



Figure 5: Factors causing a decline in the supply of economic botanicals to the Kumasi market

Table 5: Factors causing increased and o	declined demand
Factor	% Products
Factors causing increased demand	
Increased utilization	97
Product scarcity	3
Factors causing declined demand	
Less use	95
Increased Vendors	5

Table 6: Endangered economic botanicals on the Kumasi Market

Botanical name	Local name	Major Use
Acanthospermum hispidum or	Nantwibini/srahankasee	Medicinal. For curing fever.
Amaranthus spinosus		
Ageratum conyzoides	Guakuro/Boakuro	Medicinal. For curing stomach ailments.
Alchornea cordifolia	Gyamma, Agyamma	Medicinal. For curing stomach ailments and fever.
Azadirachta indica	Neem	Medicinal. Used for treatment of fever.
Baphia nitida	Edwen o/Odwen e	Medicinal. For treating haemorrhage, asthma, ringworm, wounds, jaundice and rheumatism.
Capsicum frutes cens	Mesewa	Medicinal. Ground with <i>Alstonea boonei</i> and ginger as enema; cures measles and stomach sores; boiled with other herbs for drinking to cure many diseases.
Cassia alata	Sempe, Duawusu, Yawnua	Medicinal. Treatment of fever.
Cassia occidentalis	Nk wadaa-nk wadaabo rodee	Medicinal. For curing fever, jaundice.
Chromolaena ordorata	Acheampong/Bussia	Medicinal. Used to halt bleeding e.g. in women /fresh wounds; cure severe stomach pains and fever.
Combretum sp.	Kokrodoso	Medicinal. Boiled with <i>Xylopia aethiopica and Aframoinum melegueta</i> for drinking by postnatal women to cure sores in uterus and for restorative purposes.
Crotalaria	Awiadaneadanewoho	Medicinal. Treatment of tetanus in infants (asram); boiled for drinking by infants, used in bathing infants and for enema.
Cymbopogon citratus	Fever-ahaban, Ti-ahaban	Medicinal. For curing fever.
Daniellia ogea	Hyedua/Ehyedua	Gum as incense. Burnt especially when dead bodies are laid in state. Also burnt in churches and homes, etc. to drive awa y evil/bad spirits.
Eclipta alba	Ntum	Medicinal. For the treatment of tetanus in infants.
Eremospatha macrocarpa	M fia	Woven into baskets, trays, flower vase, furniture.
Garcinia kola	Tweapea	Medicinal. Chewed to cure chest and cough ailments.
Irvingia gabonensis	Abesebuo	Rich in edible oil.
Ocimum gratissimum	Nunum	Medicinal. For curing stomach ailments and fever.
Pileostigma thonningii	Opitipata, Tofotafa	Medicinal. For curing fever
Piper guineense	Sorowisa	Medicine. Mixed with ginger for enema, to cure stomach ailments.
Psidium guajava	Oguaa, Guava	Medicinal. For controlling diarrhoea or running stomach and treatment of fever.
Scoparia dulcis	Odwan-kyene	Medicinal. Treatment of tetanus in infants
Syzygium aromaticum	Рерге	Spice. Gives falvour to food, stew and soup. Seasoning chicken, fish, meat, etc.
Terminalia glaucescens	Alatadua	Medicinal. Chewed to serve as mouth wash and to prevent tooth ache.
Vitellaria paradoxa, (Butyrospermum paradoxum, ssp. Parkii)	Nku-dua (Ash), Kadainya (Hausa)	Craft. Wood used in carving drums for local use and export.

Priority Species for Conservation

A number of species that require consideration for conservation have been identified (Table 6). These species are endangered and are likely to become extinct over time because they are scarce on the market. Their scarcity is attributable to the decline in supply resulting from decreasing availability from natural or cultivated sources although the demand for them is high. Of all the species documented, 18% were reported to be in this category, with the majority (81%) of which are of medicinal value.

Challenges and Prospects for the Market in Economic Botanicals

Three major challenges face the trade in economic natural plants on the Kumasi market. According to the plant vendors, the supply of most products to the market is irregular due to the seasonal nature of the availability of products collected from the wild. Also, the prices of products supplied by middlemen are high in the lean or dry season since most plant species collected from the wild are readily available only during the rainy period. This is aggravated by the lack of better preservation techniques to facilitate stocking of the products during periods of abundance and to retain their value over time, i.e. prolong their shelve life. Although the cost of transporting plant products to the market is high, the short shelf lives of many of these products makes vendors sell them at relatively low prices, rendering the business less lucrative.

The market is also experiencing a reduced supply and scarcity in some species due to increasing forest depletion for farming and infrastructural development and conversion of fragile ecosystems including marshy areas that harbour unique botanicals. It was also reported that harvesting methods employed by plant collectors are sometimes destructive. Vendors generally perceive a bleak future for the trade in the economic plants because of the declining resource base. They also believe that a further decline in the supply of most species is likely to occur and could lead to further scarcity or most of the plant species going into extinction.

Although patronage for some of the scarce products (chew sticks, rattan, bath sponge, and leaf wrappers) has declined due to increasing use of modern substitutes, demand is rising for some. It is observed that the proportion of products for which demand is increasing is higher than those for which it is decreasing. The rather high patronage portrays the increasing recognition of the values consumers currently attach to natural products mainly for medicinal and food purposes and their inexpensiveness. However, this trend poses a threat to the sustainability of the natural resource base. According to Rao et al. (2004), generally, forest degradation throughout the tropical world has reduced the availability of widely used medicinal species and that over-exploitation and indiscriminate harvesting of these botanicals from the wild in response to increasing demand has now led to some species becoming extinct and others endangered, narrowing their genetic base. The most vulnerable species are popular, slow reproducing species with specific habitat requirement and limited distribution.

CONCLUSION

The study has documented a wealth of indigenous knowledge on economic botanicals and vendor perceptions indicate a rising demand but declining supply for an appreciable number of species. The global market strength for herbal/botanical products alone is estimated at \$17.5 billion. Besides Ghana's economic policies support the development of non-traditional export products, which makes it favourable for the development of the natural resource base to enhance this sector. It is thus imperative to enforce policy and management

interventions that have been put in place to enable sustainable exploitation of economic plant species collected from the wild as well as develop and promote systematic cultivation methods that will ensure sustained supply, aid biodiversity conservation and protect threatened species. Cultivation in agroforestry and forest plantation systems is feasible (Rao, *et al.*, 2004). This is especially so for the endangered species and those going into extinction for which supply is declining but demand is rising.

Generally, natural products are often gathered from the wild on small scale using rudimentary gathering practices and sold through informal markets in raw or semi-processed forms (powders, decoctions, etc.) which negatively affects both the quality of gathered materials and the sustainability of the plant resource base (FPI, 2004). Research into appropriate propagation and cultivation methods and integration into appropriate production systems that ensure quality raw material, as well as improved preparation and preservation techniques (value addition), are therefore critical for the development of this sector. To gain access into the global market, quality control, product standardization and international market trends and niches may also need to be considered.

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