CHAPTER 5

Hawkers of Health: the Faraday Street Market for Traditional Medicine

TRADE AND SOCIO-ECONOMIC VALUE OF FOREST AND WOODLAND RESOURCES WITHIN THE MEDICINAL PLANT MARKET IN JOHANNESBURG[1]

As pressures on the agricultural and rural land base increase, forest products have come to provide one of the main sources of non-farm income to rural households (Arnold 1996), and along with woodlands and savannas, play a role- in the livelihood of millions of people (Shackleton *et al*. 2001). In economically stagnant rural regions, growth in non-farm activities arises when people who cannot find employment in agriculture (or urban activities') move into a non-farm activity, being absorbed principally in (he creation of labour-intensive, low return micro-enterprises (Arnold 1996). Contrary to expectations, in South Africa the reliance of rural livelihoods on the natural resource base appears to be increasing rather than decreasing (Shackleton *et al*. 2001; Lawes *et al.* 2004; Shackleton & Shackleton 2004). The harvesting and selling of medicinal plants is an example of how people from largely rural households, especially women, derive incomes from trading in forest and woodland products. As the demand for traditional medicines continues to grow, an estimated 20 000 tonnes of medicinal plant material is traded annually countrywide, most of which comes from forest and woodland habitats (Mander 2004).

The extent to which woodland and forest resources are traded for medicinal purposes is discussed in this chapter within the context of a survey carried out at the Faraday Street traditional medicine market, Johannesburg, in 2001 on behalf of the Gauteng Directorate- of Nature Conservation (Williams 2003). The primary objective was to perform an ethnobotanical survey and assessment of the market and the market dynamics thereof, including the value and volume of the species traded, to inform conservation policy within the directorate. The socio-economic values of woodland and forest resources traded in Faraday are reviewed here as a subset of the original report. It is clear from the survey that medicinal products, especially those derived from woodlands and forests, are valuable to urban consumers (±12–15 million people annually in South Africa) and the rural subsistence economy – not only as a primary healthcare resource, but also as a source of revenue to people from impoverished rural areas.

Socio-economic conditions within rural areas have motivated, in part, the participation of thousands of people in this hidden economy and the unsustainable exploitation of many woodland and forest species. Conservation programmes for over-utilised resources must, therefore, be linked with initiatives that address factors inducing participation in the trade – such as affordability and accessibility of primary healthcare, access to education and employment opportunities, and the economic climate within rural and peri-urban areas. Initiatives that address these factors include sustainable job creation and agricultural initiatives within the rural economy, in addition to market-orientated conservation wherever appropriate (Shackleton 1996, 2001).

CHARACTERISTICS OF THE FARADAY TRADITIONAL MEDICINE MARKET

Faraday is located in the south of Johannesburg under the M2 highway flyover, and was established approximately 25 years ago, originally as a 'Fridays only' market. The precinct is a significant transport node for at least 20 000 daily train, taxi and bus commuters. The market is the Witwatersrand's only informal wholesale and retail street market for traditional medicine, smaller but similar to the Warwick Street market in Durban, KwaZulu-Natal. Ninety-seven per cent of the traders are migrants to the Witwatersrand, of which 90% regard KwaZulu-Natal as 'home'. Customers are primarily traditional healers from Gauteng townships, owners of *umuthi* shops, occasionally patients seeking treatment from the healers and, rarely, commuters.

[1] Reference: Williams, V.L. (2004) Trade and socio-economic value of forest and woodland resources within the medicinal plant market in Johannesburg. Pages 439-472 *in* M.J. Lawes, H.A.C. Eeley, C.M. Shackleton, B.G.S. Geach, eds., *Indigenous Forests and Woodlands in South Africa: Policy, People and Practice*. University of Natal Press, Pietermaritzburg. ((Faraday Report.pdf; Faraday Report Appendix.pdf)

There are approximately 166 permanent stalls at Faraday. Seventy-four vendors (45%) trade from large steel lockers provided by the City of Johannesburg, and the remainder sell plants from wooden pallets or off tarpaulins. On Fridays or at month end, a contingent of 10–20 mainly Sotho-speaking women resident in western Gauteng, Free State and Lesotho arrive to sell plants mainly harvested from the grasslands in their region. They stay in the market for as long as it takes to sell the plants they have harvested – usually no more than a day. Traders without access to storage space primarily sell plant material that is more perishable (such as grassland bulbs, rhizomes and tubers) and processed (i.e. chopped or ground up). Traders with lockers have a tendency to sell a greater proportion of less perishable bark and roots harvested from woodlands and forests.

The traders in the market are the most visible in the supply chain of resource brokers. Eighteen per cent of Faraday traders harvest their own plants - the remainder either buy from commercial harvesters (37%) or harvest small quantities and buy the rest (45%). Commercial harvesters and plants mainly reach the market by bus; the Faraday committee have an arrangement with a bus company to transport traders, harvesters and harvested plants from the rural areas to Johannesburg. There are currently 15 buses operating between Mpumalanga (e.g. Bushbuckridge), various parts of KwaZulu-Natal and the Eastern Cape. At least 72% of Faraday's traders avail themselves of this service by either buying plants from the harvesters when they arrive at the market on a Friday morning, or returning to the rural areas on the bus.

The Faraday precinct was redeveloped between 2002–04, and traders will be relocated in 2004 to a new trading area 70–100 m away from their present positions. A range of facilities have been incorporated in support of a multi-racial transport system built concurrently - including an African market, informal trade market and new shops. This new development has latent benefits and disadvantages for the medicinal plant trade in the region.

METHODS

Survey overview

A stratified random and semi-quantitative survey of 101 traders was conducted in January 2001, based on questionnaires and structured interviews (Williams 2003). The interviews were performed primarily by Zulu- and Sotho-speaking research assistants. The questionnaires (adapted from Alexiades 1996; Mander 1998) covered aspects of socio-cultural demographics, income and expenditure, perceptions of plant conservation and availability, market dynamics and a quantitative inventory of all plants for sale at the traders' stalls. The quantity of each plant sold per trader was recorded as the number of 'sacks' or 'Checkers packets' (or fraction thereof) for sale.

A 'sack' is equivalent in size to a 50 kg maize sack; a 'Checkers packet' is equivalent to a plastic shopping bag commonly given out at supermarkets or most retail outlets. The total volume and mass for sale was later calculated based on conversion factors derived for specific plant part types and the ratio of Checkers packets to sacks.

Most of the information collected was the subject of quantitative analysis. Crosschecking and triangulation of the results were applied wherever appropriate. A return visit was necessary in September 2001 to estimate with greater confidence the annual volume and value of turnover in the market. A new questionnaire was designed to obtain quantitative data on the price, quantity and frequency of specific plant parts and species sales and purchases.

Data synthesis and analysis

Plant species traded were identified by matching vernacular names to botanical names from published studies, primarily from a species list compiled from a previous study of the plants traded in Witwatersrand *umuthi* shops (Williams *et al*. 2001; see also Watt & Breyer-Brandwijk 1932, 1962; Jacot Guillarmod 1971; Cunningham 1988; Pooley 1993, 1998; Hutchings 1996; van Wyk *et al*. 1997; Kroon 1999). Errors in identification are likely to have occurred. To reduce the effect of mistaken identity on the analyses 'ethnospecies' identifications were used. 'Ethnospecies' as used by Hanazaki *et al*. (2000) takes into account the folk or common name given to one or several species quoted during interviews. The Zulu name *iNgwavuma,* for example, is the ethnospecies designating *Elaeodendron transvaalense,* while the ethnospecies i*Mphepho* applies to at least six species of *Helichrysum. iMphepho* was cited 17 times during the survey, however only one of the six potential *Helichrysum* species would have been sold at each stall and the most prevalent species is not known. Wherever appropriate, the data were quantified based on the number and frequency of occurrence of ethnospecies to avoid repetitions and hence any bias or inaccuracies in reporting the results.

Three hundred and nineteen ethnospecies were identified, comprising approximately 482 species. A further 120+ common names (mainly cited once) remain unidentified. The average number of plants (ethnospecies) sold per trader was 27.3 ± 12.0 (SD), with a minimum of 5 and a maximum of 59 plants per trader. Species found in woodland and/or forest and grassland were mainly identified from Pooley (1993, 1998), Hutchings (1996) and K. Balkwill (pers. comm.).

Data were analysed using STATISTICA 6. *EstimateS* (Colwell 2001) was used to compute species accumulation curves, the Shannon-Wiener index of evenness (J'), as well as the input values for calculating Hill's numbers (NI and N2) and a rarely cited form of Simpson's diversity index ($-\ln \lambda$) recommended by Pielou (1975). Simpson's index is commonly expressed as the probability statistic λ, which decreases as diversity increases. Pielou (1975) recommends the use of $-\ln \lambda$, a diversity statistic that increases as diversity increases and is relatively insensitive to sample size (Magurran 1988).

Determining the quantity recorded during the survey

The total quantity of plants sold in Faraday was calculated from the inventoried merchandise of 101 traders as follows. First, the total number of sacks and/or Checkers packets sold per ethnospecies per trader was determined in an interview. Only the quantity visibly on display was recorded, hence stored material is not accounted for. Second, the number of Checkers packets was converted to sacks using a conversion factor of one packet = 0.0438 sacks. The total number of sacks was then determined. The relationship between sacks and packets was calculated by filling the bags with homogeneous leaf litter and then weighing them. The conversion assumed a 1:1 relationship between mass and volume, i.e. half the mass is equal to half the volume. The mean mass for one packet is an approximation for a range of species from scarce to popular (and hence small to large individual sizes and thicknesses). The point here is to reduce under- or over-estimation in the mass calculations when evaluating the whole market, especially where there are large differences in volume to mass ratios for different plant part types traded in different proportions in the market. The mean mass of a packet was obtained by filling the bag with plant material and weighing it. Finally, the total mass of the sacks for each species was calculated using the plant part conversion table for mean mass (Table 1), and hence the total mass and volume of plants in the market during the survey for 101 traders.

Table 1: Conversions for calculating the mean mass of a 50 kg-size sacks of different plant part types. Figures in parentheses are the number of species for which data were collected (from Williams 2003).

Plant part (no. spp.)	n	Mean mass of 1 small packet	SD	Conversion packet → sacks x 22.84	Approx. mass of 1 sack
Bulbs (5)	39	4.80kg	±1.58kg		109.64 kg
Bark (5)	46	2.18kg	±0.84kg		49.86 kg
Stems (1)	9	3.40kg	±1.35kg		77.66 kg
Leaves/stems (2)	10	0.46kg	±0.25kg		10.51 kg
Tubers (3)	21	4.44kg	±2.21kg		101.60 kg
Roots (4)	14	2.18kg	±1.42kg		49.77 kg
Whole plants[1] (3)	12	1.13kg	±0.74kg		25.70 kg
Fruit (3)	8	2.03kg	±0.74kg		46.25 kg
All plant parts	**159**	**2.46kg**	**±1.48kg**		**58.73 kg**

[1] There is large variability in plant mass in the category 'whole plants' that ranges from species such as *Scabiosa columbaria* and *Dianthus mooiensis* to *Haworthia limifolia* and *Ansellia gigantea*. The table is a guide for estimating mass and, where necessary, more appropriate values for the mass should be used (as they were during the calculations of volume and value in this study).

EVALUATING SAMPLE SIZE

Species accumulation curves for the samples included in this study approached a horizontal asymptote (Figure 1). This levelling of the curves indicates that sampling effort was sufficient for the entire survey (Figure 1, line a), with to 3–4 new ethnospecies cited for every 100 new records, or one new plant for every trader surveyed. The rate of new ethnospecies added to the woodland/forest curve (Figure 1, line b) is the same (3–4 ethnospecies for every 100 citations). The probability that the next plant recorded represents a new species decreases as the asymptotes are reached, therefore nearly all the ethnospecies traded at the market were detected and the sample size is adequate.

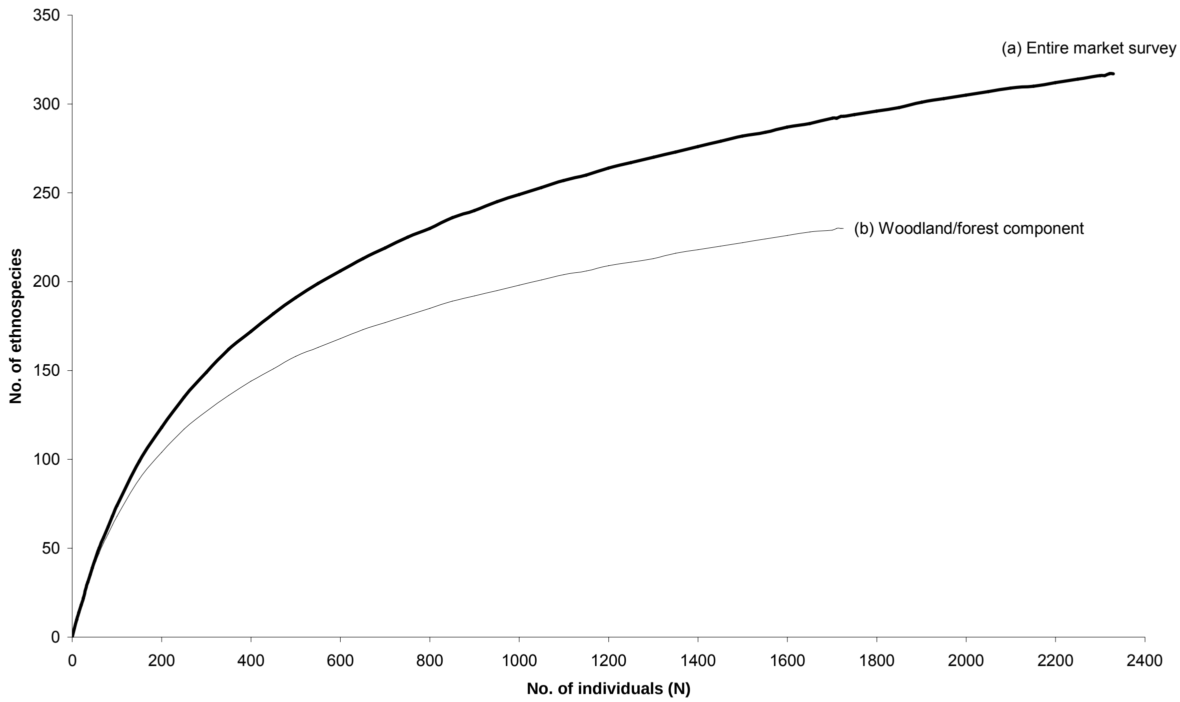

Figure 1: Species accumulation curves for ethnospecies traded in Faraday by 101 traders as a function of increasing N (records/citations of plants traded), and the sub-sample of woodland/forest resources.

SOCIO-ECONOMIC PROFILES OF THE FARADAY TRADERS

Seventy per cent of the traders at Faraday are women (Table 2), usually single or widowed. Nearly all the traders in the market are Zulu, and only 44% are healers. Ninety-three per cent of the traders are the only income providers for their households; 64.2% are women and 28.8% are men. Only 7% of the traders are not from single-income households – all of whom are less than 25 years old and single. All the married women in the market are the only breadwinners for their own and often extended families. Hence, for these income-generators, unable to rely on an additional household income from a spouse, and with few formal sector opportunities and a family to care for, gathering and trading in traditional medicine is an important means of economic survival. However, the returns are so low that they are unlikely to accumulate much capital and move beyond their current situation.

Fifty-one per cent of the traders are between the ages of 26 and 45 (Table 2). There are no significant gender differences in the age profiles of the traders. Studies in the trends of women's trading operations have shown that 'petty' trading may draw to its ranks women of a particular age, marital status and low educational standing, as well as those who are forced into migration and can find no formal sector employment (Friedman & Hambridge 1991). The activity therefore provides a haven for older, less skilled and single or divorced women, but the returns for long hours are low and the risks of prosecution are high (Friedman & Hambridge 1991). This is certainly the case with the Faraday traders; while older women are not necessarily more prevalent in the market, single and widowed traders comprise 64.2% of the surveyed participants. In addition, more than 70% of the traders have never had formal education beyond Grade 7.

Table 2: Socio-cultural demographics of the Faraday traders (n=101)

	Percent
Language	
Zulu	95.8%
Sotho	2.1%
Xhosa	1.1%
Tsonga	1.1%
Gender	
Female	69.5%
Male	30.5%
Marital Status	
Single	59.8%
Married	33.7%
Widowed	6.5%
Age profile	
15–25 years	17.1%
26–35 years	17.0%
36–45 years	34.0%
46–55 years	14.8%
56–65 years	9.6%
65+ years	7.5%
Healer status	
Non-healer	55.8%
Traditional healer	44.2%
Schooling	
No schooling	40.2%
Primary school	33.7%
High school	24.0%
Tertiary education	2.1%
Household income	
Single income	93%
Additional income	7%

Interestingly, fewer healers than non-healers have had primary or secondary education, but this has not restricted their earning capacity as much as the already marginalised non-healers – primarily because their occupation ensures additional revenues from consultations with patients. Non-healers have different motives for entering the trade and most have searched for other means of employment (usually as domestic workers) before entering the market as a 'last resort'. This lends weight to the opinion that job opportunities in the formal business sector and the rural subsistence economy have failed to keep pace with the growing number of new job seekers (Huntley *et al*. 1989).

Forty-eight per cent of the traders cited weekly earnings of less than R100, and a further 28% cited earnings of R100–200 per week (Williams 2003). The extent to which income may have been under-reported was evaluated in a number of ways, including calculating the minimum monthly expenditure (e.g. travel, accommodation, food) as an indicator of gross monthly income (assuming they break even, and therefore income equals expenditure). Results showed that projected expenditure, as a measure of gross income, was commensurate with the traders' cited weekly income, but did not include the cost of plant purchases or a profit margin, i.e. a negative gross income. If plant purchase costs are added to weekly expenditure, then the weekly income for approximately two-thirds of the traders is likely to reach R200 per week. Overall, however, median weekly incomes are expected to be Rl50–250. Given that the majority of Faraday traders live at a subsistence level, underreporting of income levels was not considered to be significant.

DIVERSITY OF WOODLAND AND FOREST RESOURCES TRADED

Taxa

Woodland and forest resources account for approximately 63% of the species traded, with 10% of those species shared with the grassland biome (Table 3). The most commonly traded woodland/forest species are *Sarcophyte sanguinea, Elaeodendron transvaalense, Albizia adianthifolia, Acacia xanthophloea* and *Sclerocarya birrea* (Table 4). The species traded for bark were largely those species cited by Grace *et al*. (2002) as the most popular plant species used for bark in KwaZulu-Natal. However, scarcities have reduced the frequency with which species such as *Ocotea bullata,* *Warburgia salutaris* and *Elaeodendron croceum* (formerly *Cassine papillosa)* are available to consumers. Approximately eight (0.25%) of the woodland species sold are exotic or alien invasive species, the most popular being *Cinnamomum camphora.*

Table 3: The number and percentage of taxa traded in Faraday that are from woodland/forest and/or grassland.

	No. species	% species	No. genera	% genera	No. families	% families
Market survey	482	100%	283	100%	105	100%
Woodland/forest component[1]	302	62.7%	203	71.7%	90	84.7%
Grassland component[1]	227	47.1%	116	41.0%	42	40.0%
Woodland/forest and grassland	47	9.8%	36	12.7%	27	24.7%

[1] *includes* the number of shared taxa

Table 4: The most abundant woodland and forest species traded in the market. Listed species were sold at 20% or more of the stalls and/or totalled more than six sacks.

Species	Zulu name	Plant part	% traders (n = 101)	No. sacks[1]
Sarcophyte sanguinea[2]	*uMavumbuka*	Root	49	19.0
Elaeodendron transvaalense	*iNgwavuma*	Bark	48	16.1
Albizia adianthifolia	*umGadankawu*	Bark	42	18.1
Acacia xanthophloea	*umKhanyakude*	Bark	38	12.1
Sclerocarya birrea ssp. *caffra*	*umGanu*	Bark	32	13.2
Schotia brachypetala	*iHluzi, umGxamu*	Bark	32	11.2
Adenia gummifera	*imPindamshaye*	Stem	29	8.9
Dioscorea sylvatica	*iNgwevu, uFudu*	Tuber	29	7.5
Rapanea melanophloeos	*uMaphipha*	Bark	27	10.2
Curtisia dentata	*umLahleni*	Bark	25	9.2
Clivia sp. (C. miniata, C. nobilis)	*uMayime*	Whole	25	11.2
Trichilia sp. (T. dregeana, T. emetica)	*umKhuhlu*	Bark	24	9.8
Rhoicissus tridentata	*isiNwazi*	Root	24	6.1
Ekebergia capensis	*umNyamathi*	Bark	23	7.8
Maytenus undata	*inDabulaluvalo*	Bark	21	6.3
Warburgia salutaris	*isiBhaha*	Bark	21	4.9
Dombeya rotundifolia	*inHliziyonkulu*	Bark	21	8.5
Balanites maughamii	*uGobandlovu*	Bark	19	6.9

[1] The total volume recorded between 101 traders in January 2001.

[2] The Zulu name *uMavumbuka* applies to both *S. sanguinea* and *H. africana.*

Patterns of diversity and species use

In evaluating the patterns of diversity and species use evident in the woodland/ forest flora traded for medicinal purposes, three questions arise: (1) what is the richness of the ethnospecies that are sold; (2) what is the ethnospecies diversity; and (3) are the same ethnospecies sold by most traders, i.e. is the distribution of plants in the market equitable, or is there a tendency for domination by a few species?

Woodland and forest resources are a smaller subset of the commercially traded species in Faraday (Table 5). The values for Simpson's index suggest a high diversity, with the woodland/forest component being slightly less diverse than the overall survey (Table 5). While a few woodland and forest species are more frequently encountered in the market than others (e.g. *Sarcophyte sanguinea, Elaeodendron transvaalense* and *Albizia adianthifolia*), they do not necessarily dominate sales. Instead, the distribution of species throughout the market is fairly equitable, even with most traders selling the same species (as evidenced by J' close to 1). From Hill's diversity numbers (which give a measure of the effective number of species in a sample), it can be seen that of the 232 woodland ethnospecies sold in Faraday there is a core group of about 137 (59%) that are 'abundant' in the sample, and 104 (45%) that are 'very abundant'. If species abundance in the market equates with plant popularity, then at least half of the woodland/forest plants are more sought after than others by consumers.

Table 5: Measures of diversity for ethnospecies traded in Faraday: woodland and entire sample.

Index/Measure	Symbol	Woodland/forest spp.	Entire sample
Species richness			
No. ethnospecies	S	232	319
Index of diversity			
Simpson's index	$-\ln \lambda$	4.71	4.95
Hill's diversity numbers			
No. abundant ethnospecies	N1	136.5	183.8
No. very abundant ethnospecies	N2	104.3	135.5
Measures of evenness/equitability			
Shannon	J'	0.903	0.904

The high evenness/low dominance in the distribution of species sold in the market indicates that traders and customers do not necessarily narrowly favour a limited range of forest and woodland resources even though scarcities of some popular species have arisen. It is plausible that if scarcity was not a limiting factor for certain popular, and therefore under-reported species, then the overall evenness of the sample could be lower, hence indicating a greater dominance in the use of these species. There are, however, other factors mitigating plant scarcities besides collection for medicinal purposes, hence scarcity is not necessarily always a function of high demand by the medicinal plant trade. Additionally, the high diversity of geographically available and socio-economically valuable species weakens the effect of dominance by a few species.

Probability of use and affinity with southern African biomes

Exploring the contributory factors behind use and the socio-economic value of certain woodland resources raises the following questions: (1) are taxa concentrated in particular families and biomes; and (2) do certain taxa have a higher than expected probability of being used? In a study by Williams el al. (2000) that examined the trade in medicinal flora in Witwatersrand *umuthi* shops, taxa used and traded for medicinal purposes in the region were found to have more in common with savanna (r_s =0.45, P=0.0048) than grassland (r_s =0.37, P=0.104) and other biomes. Woodland resources are harvested from savanna and, by extension, therefore corroborate evidence in Table 14.3 that the plants from this biome are more prevalent in the Faraday market.

There is a positive association between plants used and sold commercially for medicinal purposes, and the size and distribution of southern African floral families (Williams *et al*. 2000). Larger plant families occurring in biomes proximate to the medicinal markets and the rural homesteads of harvesters have a greater probability of being harvested. Savanna, woodland and forest have a higher probability of being used for several reasons. First, the savanna biome is the largest in southern Africa south of 22^{o}S, occupying about 46% of the total area, and over one-third the area of South Africa (Low & Rebelo 1996). Second, at least 70% of traders in Faraday cited localities within KwaZulu-Natal savanna and forest as being the source of plants they had harvested or bought (Williams 2003). Additionally, at least 67% of the traders cited similar localities within KwaZulu-Natal as being their 'home'. While savanna is the most used biome of commercially traded medicinal plants in southern Africa, it is not necessarily the most threatened by use and commercial harvesting. Grassland covers 17% of southern Africa and accounts for about 40% of the traded taxa and volume. Forest covens less than 0.25% of southern Africa's surface area (Low & Rebelo 1996) and is an important source of bark from many of the species traded, e.g. *Rapanea melanophloeos, Curtisia dentata, Prunus africana, Warburgia salutaris, Ocotea bullata* and many others.

Distinguishing between the probability of plant use based on (1) availability due to the size of the floral families; (2) availability due to family distribution; or (3) use based on other factors such as the presence/absence of pharmacologically active compounds, was examined (Williams *et al*. 2000). Traded plant families could be divided into four groups depending on whether there was a statistically significant under- or over-use of plant taxa per family, and the size of the family traded (Table 6).

Table 6: Probability of use and affinity with southern African biomes. Numbers in parentheses represent the number of genera in woodland/forest families shared with grassland. NR = no rank.

Group[1]		Family	No. of woodland / forest genera traded		Rank in savanna[2]	Rank in grassland[2]
I	Species use proportional to species availability in southern African flora and biomes.	Fabaceae	19	(2)	2	3
		Orchidaceae	7	(1)	14	8
		Rutaceae	5		NR	NR
IIa	Higher than expected probability of being used	Euphorbiaceae	12		8	12
		Liliaceae *s.l.*	9	(3)	5	4
		Rubiaceae	7	(2)	4	11
IIb	Lower than expected probability of being used	Compositae	7	(6)	3	1
		Asclepiadaceae	5	(1)	9	7
III	Proportionately more species used per family than expected considering the generally smaller family size in the southern African flora	Celastraceae	6	(1)	NR	NR
		Rhamnaceae	5		NR	NR
		Anacardiaceae	4		20	20
		Cucurbitaceae	4	(1)	NR	NR

[1] From Williams *et al.* (2000)

[2] From Gibbs-Russell (1987). Rank was assigned according to the total number of taxa of the family in the biome. Rank was not assigned if families were represented by less than 1% of the total number of taxa in the biome.

For families such as Fabaceae occurring in Group I, species use is likely to be proportional to their availability in the southern African flora and biomes, and random – i.e. any species within the family has an equal chance of being harvested due to the large size of the family and/or the distribution of the taxa. The high use of taxa from Fabaceae (and especially Mimosoideae) for medicinal purposes is consistent with a study by Luoga *et al*. (2000) in a Tanzanian forest reserve and adjacent communal lands. At least 37% of the tree species used for remedies were from the Fabaceae, the most number of medicinally used taxa per plant family in the study (Luoga *et al*. 2000).

For species in Group II, there is either a higher or lower than expected probability of corresponding families being used. High probabilities are therefore not only related lie family size, but also the likely occurrence of large quantities of active compounds (e.g. Euphorbiaceae and Liliaceae *sensu lato*). Low probabilities of use despite family sizes (e.g. Compositae and Asclepiadaceae) are related to chemical inertness, toxicity and/or higher availability/access that have resulted in the erosion commercial (but not medicinal) value (e.g. Compositae and Poaceae).

Families in Group III have proportionately more species used per family than expected, the family sizes are smaller and they have low or no rank in savanna and island. This suggests other reasons for the high probability of use, including the valence of pharmacologically active compounds.

The use of and demand for traditional medicines can be species-specific and alternatives are not easily provided due to the characteristics of the plant material, their symbolism, and the form in which they are taken (Cunningham 1991a). The dependence of people on their natural environment for health and survival has evolved over centuries of experimentation with the available flora, and the lack of scientific proof of the efficacy of (some of) the medicines does not necessarily devalue resources (Mabogo 1990). So too has the socio-economic value of woodland and forest resources evolved, initially as health and household resources and later, as will be demonstrated, as an important source of income within the rural economy.

Plant parts

The degree of disturbance to a plant population and the impact of harvesting are related to the part of the plant that is harvested. The removal of whole plants, bulbs, roots and bark is more immediate and damaging than the removal of leaves and fruit (Cunningham 1988), and limits the future regeneration and recruitment of individual plants and/or populations. The socio-economic value of woodland/forest species is primarily in the roots and bark (Figure 2), and the risk to individual species depends on the volume and frequency of bark and root removal (Grace *et al*. 2002), as well the resilience to harvesting. *Elaeodendron transvaalense* individuals observed near Hluhluwe, KwaZulu-Natal, that had 40% bark removal displayed trunk death on the side that had been stripped. By contrast, *Warburgia salutaris* individuals in the Soutpansberg that had last been harvested for bark at least 20 years ago displayed signs of bark regrowth and resprouting both above and below the scarred trunks. Unsustainable harvesting has a higher impact on popular, slow-growing and slow-reproducing species that have specific habitat requirements and limited distributions (Grace *et al*. 2002). Over the last seven years, there has been a noticeable decline in the availability of popular and/or slow growing species such as *Ocotea bullata, Stangeria eriopus* and *Warburgia salutaris* in the Witwatersrand u*muthi* shops and markets (Williams 2003).

While individual species harvested for roots predominate in the market (Figure 2), the greater demand and economic value is for the bark. Of the woodland/ forest plants for sale in Faraday, bark is sold in the greatest volume (Figure 3), comprising 52% of the woodland volume that is traded in the market. A volume of bark equivalent to more than 300 sacks was recorded for sale among the 101 traders who were interviewed. The high concentrations of active ingredients in bark are a factor in their intensity of use (van Wyk *et al*. 1997).

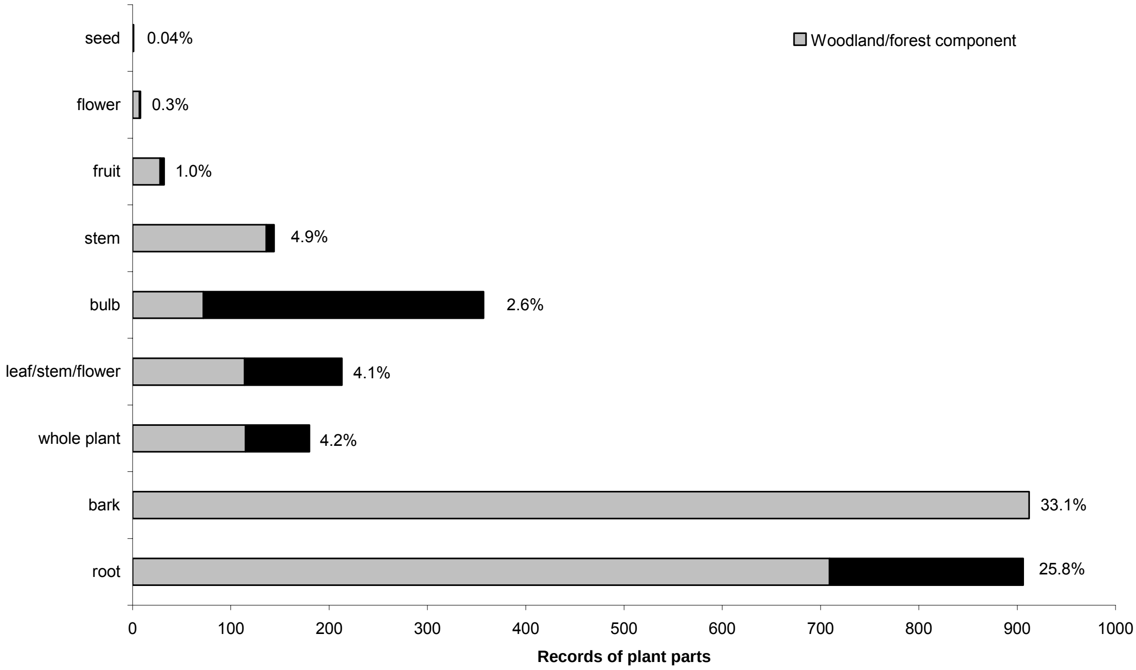

Figure 2: The total number of recorded plant parts. The percentages and the grey area bar indicate the woodland/forest component of the traded plant parts. For example, 25.8% of all plants sold in Faraday were woodland/forest plants harvested for their roots.

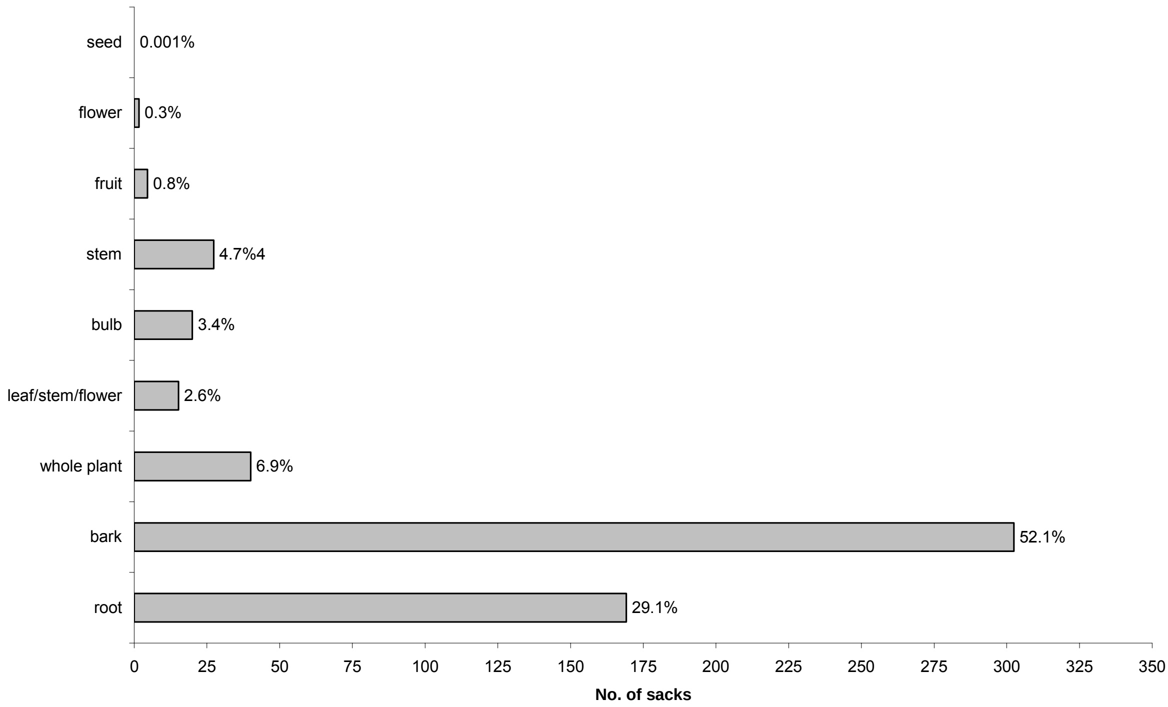

Figure 3: The quantity of sacks recorded per plant part of woodland/forest species for sale in Faraday between 101 traders, and the percentage of the total volume of woodland/forest resources sold.

SOURCE OF SUPPLY

The majority of plants sold in Faraday are harvested in KwaZulu-Natal, accounting for at least 66% of cited sources, followed by Gauteng (6.8%), Mozambique (1.2%) and Lesotho (0.8%). Of the quantity harvested in KwaZulu-Natal, two-thirds is from forest and woodland areas in the Maputaland and Zululand regions such as Emanguzi, Ingwavuma, Hluhluwe, Nongoma and Mtubatuba. There is considerable labour migration between Lesotho, Swaziland, Mozambique and South Africa that promotes a large informal movement of plants between countries (Mander 1998). Mander (1998) reported that species that were once available in South Africa like *Bowiea volubilis* and *Warburgia salutaris* are imported in large quantities from Swaziland and *Warburgia salutaris* are imported in large quantities from Swaziland and Mozambique. Half of the *Siphonochilus aethiopicus* sold in Faraday was harvested in Swaziland, Mozambique and Zimbabwe. Forty-three per cent of *Warburgia salutaris* sold in Faraday originated in Mozambique.

The declining access to popular plants has led to an extension and intensification of the gathering network at regional and national levels (Marshall 1998). A comparison between the location of plants harvested for trade in KwaZulu-Natal from 1988–96 indicates that for popular plants there has been an average increase in travel time by 45%, with several plant species being harvested exclusively from neighbouring countries (Mander 1998).

VOLUME AND VALUE OF WOODLAND AND FOREST RESOURCES TRADED IN FARADAY

The economic value of woodland and forest resources to communities is reflected in the extent to which they are traded in the market, and the contribution to the traders' income. For 93% of the vendors in Faraday, earnings derived from selling medicinal plants are the only income to the household, apart from the pensions of retired family members. The volume traded is an indicator of potential risks to the survival of certain species should current harvesting trends continue.

Among the 101 surveyed traders, a total of 756 sacks of plants were recorded for sale, of which 560 sacks (74%) represented woodland and forest species (Table 7), The total mass of the 560 sacks is about 30 tonnes (68% of the total mass). At least 5.2% of this mass is shared with grassland species. In other words, for every tonne sold, 630 kg are harvested from woodland and forest, 320 kg are harvested from grassland, and 50 kg are common to both woodland and grassland. Based on the estimates for the quantity of plants sold in Faraday annually (Williams 2003), and given that at least 68% of the total mass is for woodland and forest resources, then approximately 334 tonnes ±579 tonnes (SD) of woodland/forest species are sold annually in Faraday (Table 7).

Table 7: Estimated quantity of woodland and forest resources present in Faraday during the survey of 101 traders in January 2001, and sold annually for the en tire market.

101 traders	Total	Woodland/forest[1]		Shared species		Grassland[1]	
No. sacks	756.3	560.0	74.0%	41.7	5.5%	238.0	31.5%
Mass	44 356.4 kg	30 148.6 kg	68.0%	2 316.4 kg	5.2%	16 324.1 kg	37.2%

Estimated annual quantity of woodland/forest resources sold in Faraday

Estimated mass of plants sold annually in Faraday = 491 ± 851 tonnes (Williams 2003). 68.0% of this total mass is estimated to be derived from woodland and forest species. Therefore, the estimated mass of woodland/forest resources sold annually in Faraday = 334 ± 579 tonnes.

[1] Figures include the quantity for shared woodland/grassland species.

The largest volume traded during the survey was for *Sarcophyte sanguinea* (19 sacks between 49 traders), followed by *Albizia adianthifolia* (18.1 sacks between 42 traders) and *Elaeodendron transvaalense* (16.1 sacks between 48 traders) (Table 4). It is difficult to predict the quantity of each species sold annually. On average, the bark of popular species is purchased by a trade about once every three months. A conservative estimate of 50 sacks per species, or about 2 500 kg each, can therefore be inferred. Scarcity, season and availability, however, all have an impact on the total volume and frequency traded by the street sellers. For a scarce species like *Ocotea bullata*, for example, 1.74 sacks were for sale among nine traders (±2 packets per trader). In the case of *Warburgia salutaris,* there were 4.9 sacks among 21 traders. The limited availability of these species probably results in no more than 10–20 sacks being sold annually in Faraday, and even fewer sacks for less popular and/or scarcer species.

Woodland and forest species traded in Faraday are estimated to account for 73% of the total wholesale and retail value (Table 8), of which 6% is shared with grassland species. The annual retail value of Faraday is R2.22–4.72 million, hence the total annual retail value of forest/woodland resources is estimated to be RI.62– 3.44 million (for 2001). In other words, for every R100 spent or earned, approximately R67 is derived from woodland/forest taxa only, R26 from grassland taxa only, and R6 from taxa that are both woodland and grassland. Thus the economic value of woodland versus grassland resources to the traders, and hence rural livelihoods participating in the medicinal plant trade, is very high. Scarce species are usually sold at twice the price of non-scarce species (Table 9) and may have a greater demand because of potentially higher wholesale and retail values. However, the net value to the harvesters is usually eroded by the actual cost of locating these species.

Table 8: Estimated value of woodland and forest resources sold in the Faraday market, based on the survey of 101 traders and extrapolated annually to 166 traders.

101 traders	Total	Woodland/forest[1]		Shared species		Grassland[1]	
Wholesale	R73 511	R54 104	73.6%	R4 468	6.1%	R23 875	32.5%
Retail	R190 687	R139 016	72.9%	R10 838	5.7%	R62 508	32.8%

Estimated annual retail value of woodland/forest resources sold in Faraday

Estimated annual retail value of plants sold in Faraday = R2.22–R4.72 million (Williams 2003).
72.9% of the total retail value is estimated to be derived from woodland and forest species.
Therefore, the estimated annual retail value of woodland resources sold in Faraday = R1.62– 3.44 million.

[1] *Includes* the value for shared woodland/grassland species.

Table 9: Wholesale price range of 50 kg-size sacks bought by the street traders (From Williams 2003)

Plant part	Median	Mode	Range	Scarce species	n
Bulbs	R80	R70	R70–R100	+ R120 per sack	25
Bark	R90	R100	R70–R100	R200 per sack, e.g. *Warburgia salutaris*	37
Tubers	R100	R100	R80–R100	+ R110 per sack	15
Stems	R90	R100	R60–R100	–	6
Roots	Generally not bought in 50 kg-size sacks, but as bundles for R3 each or smaller volumes for R50–R100; scarce species are usually twice the price for the same volume				
Fruit	Generally bought as half a sack for R100 or less				

SOCIO-ECONOMIC VALUE OF TRADED WOODLAND AND FOREST MEDICINAL RESOURCES

Plant resources, including those from forest and woodland, provide a buffer for rural communities against poverty and unemployment during cyclic economic depression (Cunningham 1991b), and an employment prospect where formal education-reliant opportunities are lacking. Resource harvesting and use is a way for poor, rural households to engage in a number of livelihood sectors as a means of diversifying opportunities and livelihood security (Cavendish 2000; Shackleton *et al*. 2001).

Most street traders in Faraday, and the commercial harvesters in general, have had limited education and the traditional healers among them even less. In addition, they come from impoverished regions of KwaZulu-Natal, usually single income households, where current low living standards are exacerbated by unemployment, lack of education and skills, inadequate access to primary healthcare facilities (except for traditional medicine) and more recently the AIDS pandemic. 'Need' rather than 'greed', stemming from local poverty and unfavourable rural socio-economic conditions, is a stimulus for unchecked over-exploitation of medicinal resources, causing gatherers to harvest as much as possible to maximise their short-term income and provide livelihood support. The prospect for sustainable use is thus undermined (Dovie *et al*. 2002).

Although demand-related plant scarcities drive up market prices, higher prices paid for certain species encourages depletion of the resource because of the potentially higher income generated. In addition, low prices paid for plants act as a stimulus for over-collection, as traders feel compelled to over-harvest in order to obtain a reasonable income (Lewington 1993). Market conditions therefore work against the environment (Bodeker 1997).

People in rural households whose income falls below the poverty line are often forced to seek employment in towns and cities, creating strong urban linkages and dependencies (Shackleton *et al*. 2001). Even though the medicinal plant market is driven by customer demand to a degree, a factor in the expansion of the trade is poverty within rural households. Harvesting medicinal plants is often an activity of 'last-resort' for many non-traditional healers (Kepe 2002). Activities of last-resort are sometimes characterised by low capital or skills thresholds, and participants are likely to find themselves in over-saturated markets that offer very low returns for labour (Arnold 1996). Consequently, opportunities become limited and these activities are likely to be abandoned if more attractive options become available -an opinion expressed by several traders who were interviewed during the survey.

The high incidence of women involved in harvesting forest/woodland products appears to reflect easy access to resources (Arnold 1996). Women traditionally use these resources for other household needs (e.g. fuelwood, food and housing), hence the extension of the gathering activity to species with commercial value and on a larger scale. In towns along the boundary of the Kruger National Park in Limpopo Province and Mpumalanga, women again dominate the trade in medicinal plants, although interestingly here they appear not to be the sole breadwinners in the household (Botha *et al.* 2004). Dovie *et al*. (2002) report that women were the primary harvesters of woodland resources in 73% of the households in Thorndale, a rural village in the Bushbuckridge lowveld of Limpopo Province. Thirty-three per cent of households in Thorndale used medicinal plants at various times of the year, however people perceived the harvesting of woodland resources as an activity of poorer households (Dovie *et al*. 2002). The trend for women to be involved as gatherers and sellers began in Durban in 1915. Herbal medicines became a means of wholesaling wild collected plants, rather than dispensing medicines (Cunningham 1991a). Initially most of the sellers were men, but this has changed to an activity where at least 90% of the sellers in Durban are now women.

The socio-economic value of woodland and forest resources therefore becomes linked to factors that go beyond 'what is this plant, what is it used for, and what is its monetary value?' Bodeker (1997) makes the point that a feature of traditional health systems is that they span a diverse range of policy issues that extend beyond the immediate domain of health. Similarly, the use of woodland and forest resources for medicinal purposes extends beyond a utilitarian value and towards a means of sustaining rural livelihoods. A feature of unsustainable resource use is that it spans a diverse range of policy areas that extend beyond the immediate domain of conservation. The challenge, therefore, is to reconcile natural resource use and conservation (Dzerefos & Witkowski 1999). Dzerefos (2004) describes one approach developed at the Abe Bailey Nature Reserve, Gauteng.

The declining supply of resources is likely to generate significant and economic welfare losses and loss of income-generating opportunities, especially considering the large number of people who either consume or are active in the trade of indigenous medicinal plants (Mander 1998). Shackleton *et al*. (2001) estimate that 50– 00% of rural households are partially dependent on medicinal plants as a resource for a range of basic living requirements. Given that woodland and forest taxa contribute significantly to the national volume and value of trade in medicinal plants, and to at least 73% of the traders' income, these biomes are essential to the maintenance of rural and peri-urban livelihoods. However, because most of the Faraday traders' earnings are spent in the city, little of their accumulated savings benefits their rural families once expenses like accommodation have been deducted from their income. It is the earnings of the commercial harvesters who do not reside in Johannesburg for long periods of time, and usually only sell plants to the traders in Faraday, that are most likely to benefit rural households because they spend very little money in the city.

Woodland and forest probably yield the greatest diversity of wild products for dependent rural communities in South Africa (Shackleton *et al*. 2001). Together, woodland and forest account for approximately two-thirds of the medicinal resources used and traded commercially in the Witwatersrand. There is, therefore, strong selection for these species – especially among users in KwaZulu-Natal and Mpumalanga, where the percentage of species sold and their socio-economic value is likely to be higher considering the location of the users and markets within the biome. The Witwatersrand is an urban transitional zone between grassland and savanna and attracts a diversity of people, migrant labourers and commercial gatherers from all over southern Africa (including Lesotho and the Free State) who are consumers and vendors of traditional medicine. Therefore, a larger market for grassland species in Johannesburg is likely, compared to KwaZulu-Natal.

Mander (1998) estimated that consumption in Durban (of all plant medicines, not just those derived from woodland) is around 1 500 tonnes per annum. Shop traders were estimated to trade 340 tonnes per year, and street traders 880 tonnes per year (physical stocks of plants entering the street market in a year) (Mander 1998). Assuming that 68% of traded stock is woodland/forest resources (as it is in Faraday), then at least 1 020 tonnes of woodland and forest products are traded in Durban annually, and street traders sell at least 598 tonnes. The national trade of medicinal plants is estimated to be 20 000 tonnes with a value of approximately R270 million (Mander 1998, 2004), which, by extrapolation, is then valued at 13 600 tonnes and R197 million.

Lange (1998) suggests that a good way of conserving medicinal plants is through ensuring that the commercial value of the resources provides an economic incentive to the harvesters (communities and individuals) to conserve the areas in which the plants grow. The challenge for southern Africa is developing sustainable incentives that encourage curatorship and management of plant resources *concurrently* with sustaining rural incomes and livelihoods that are not overly detrimental to the environment. Shackleton (2001) makes the point that the existence of a market for forest resources does not guarantee conservation of the resources, but under the right circumstances, market-orientated conservation can be a vehicle for some of the resource values to be realised, thereby providing *some* incentive to some stakeholders to conserve the resource in question.

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