

Selecting medicinal plants for cultivation at Nqabara on the Eastern Cape Wild Coast, South Africa

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THE INTENSIVE HARVESTING OF MEDICINAL plants for commercial trade in South Africa poses a threat to many species. Cultivation has therefore been considered as an alternative to collection in the wild. This paper aims to assess the feasibility of cultivating medicinal plants in the Nqabara Administrative Area on South Africa's Wild Coast. A combination of participatory and formal research methods was used to collect data on the importance of medicinal plants, collection localities, market prices, the time spent collecting plants and their ease of cultivation. The values attached to medicinal plants were mainly dependent on their market prices. Four of the five Nqabara traditional healers interviewed cultivated these plants in their home gardens, but many medicinal products were obtained in indigenous forests from the bark of large trees, which were unsuitable for cultivation. Collectors said that the proximity of forests to their homesteads and the richness of forests in medicinal plants influenced their selection of harvesting localities. There was no correlation between time spent collecting species and their market prices. These prices were, however, positively correlated with the species' perceived healing properties. Users acknowledged that harvesting had an adverse effect on large trees, are eager to cultivate them and are taking action to conserve indigenous forests. Community-based enterprises should focus on species that are easy to cultivate and have a high demand, such as *Stangeria eriopus*, *Acalypha glabrata* and *Behnia reticulata* but not *Araujia sericifera*, which is exotic and abundant. The main barriers to commercial cultivation are availability of suitable land, water, lack of start-up capital, and access to markets and to seeds. Cultivation of medicinal plants could contribute to the economic empowerment of women in rural areas.

Introduction

Medicinal plants occupy an important place in the healthcare systems of developing countries. The World Health Organization (WHO) estimates that more than 80% of the healthcare needs in these countries are met through traditional healthcare practices.¹ The use of shrubs, herbs and trees for medicinal and spiritual purposes is an ancient practice, which continues to thrive in South Africa today, with an estimated 27 million South Africans using indigenous biomedicines.² The

economic value of this trade in South Africa is estimated to be worth US\$60 million annually⁴ (approximately R4 billion), and involves qualified traditional healers, as well as thousands of commercial gatherers who supply both the formal and informal trading outlets.³

Self-medication is a common practice in rural parts of the Eastern Cape province of South Africa, and wild-harvested herbal medicines are regularly used as the initial response to illness.¹ These plants have long played an important role in the lives of the amaXhosa people, the primary inhabitants of the study area. Even with the establishment of western medicine, the Xhosa people have not abandoned their traditional health practices. Using medicinal plants is part of their traditional way of life and they believe that discarding it will mean abandoning their culture.⁵

The plants used in traditional medicine are mostly collected from the wild. More than 700 plant species are actively traded for medicinal purposes throughout South Africa and intensive harvesting of this wild material is resulting in the decline of stocks of many sought-after species, becoming a serious threat to the biodiversity of the region¹. As human populations grow, demand for traditional medicines will increase and the pressure on natural resources will become greater than ever¹. This trend has in turn resulted in shortages of products and associated increases in prices, making indigenous medicine less accessible to the poor, except if self-collected.⁶ Furthermore, the livelihoods of medicinal plant traders, who are primarily black rural women, are becoming threatened as available stocks decrease.¹

Until recently, the most common approach to conserving medicinal plants in South Africa was through law enforcement.⁷ However, this proved ineffective because of lack of personnel. It has also been difficult to police the numerous trading outlets.⁸ Cultivation has therefore been considered an alternative to wild collection, as this may help relieve the over-exploitation of natural populations of medicinal plants.⁹

It has been speculated that cultivation may be ineffective as traditional healers might find cultivated plant material unacceptable. Recent research in the Eastern Cape¹ showed, however, that up

to 82% of urban-based healers and 69% of clinic patients were willing to make use of cultivated plant material for medicinal purposes.

The feasibility of cultivating medicinal plants depends on local beliefs and capabilities, which may vary from one area to another, the ease of cultivating these species, and the economic potential of those that can be cultivated. Objective feasibility assessments are therefore required before medicinal plant cultivation schemes are launched. The study reported here forms part of a larger focus on participatory forest management in Nqabara,¹⁰ and aims to prioritize plants for cultivation in the Nqabara Administrative Area (AA). It seeks answers to the following questions:

- Which medicinal plant species are important to traditional healers in the area?
- Which medicinal plants do healers believe can be cultivated in home gardens?
- Is there a relationship between the healers' importance ranking of plants, and the time spent collecting them?
- Is there a relationship between the importance ranking of plants and their market price?
- What is the community doing to prevent the over-harvesting of medicinal plants?

Study area

The Nqabara AA is located in hilly undulating terrain along the Wild Coast in the Eastern Cape province. It is situated in the Mbhashe municipality, in the former Transkei region. The area covers approximately 7580 hectares¹⁰ and is the well-defined area between the Nqabara River on the eastern side and Nqabarana River in the west (32.27°S, 28.73°E) (Fig. 1).

The presence of many estuaries, wetlands and forest patches makes this one of the most diverse parts of South Africa in terms of landscape diversity. This diversity contributes to the extraordinary scenic beauty of the area, and is caused by a combination of climatic, geomorphological and edaphic factors, anthropogenic fires, human land-use and consumption practices.^{10,11} The vegetation is classified as Coastal Forest and Thornveld.¹² Large stretches of grassland are interspersed with patches of indigenous forest. The grassland generally occurs on the higher ridges whereas the forest patches occupy the moist, deeper soils in the valleys, with the woodland in a transitional zone between the forest and the grassland. The grassland is characterized by herbs, shrubs and tall coarse grasses.¹³ The forest patches are intensively used as sources of fuel wood, construction material and medicinal plants. Forest margins have a

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woodland appearance because of the emergence of early successional species such as *Acacia karroo*. Timmermans and Naiker describe the vegetation in the area as a grassland-woodland-forest mosaic. In total 170 woody tree species have been identified in the area.¹⁵

The geology of the region is dominated by the Beaufort and Ecra series of the Karoo system. There are also numerous doleritic intrusions.¹⁴ The soils are generally shallow, fine-grained sandstones, mudstones and shales of the Fernwood and Normanci forms. The area is located within a climatic transition zone between the temperate south coast and the subtropical north coast, with moderate temperatures, with a mean of 21.5°C in the winter months and 24°C in summer.¹⁵ Winters are cool, dry and generally frost-free. Rain falls mainly in summer (October–April) with a mean annual rainfall of more than 1000 mm.¹⁰

Agriculture and pastoralism are the dominant forms of land-use in the area. Cultivation is largely restricted to the summer months when rainfall is highest.¹⁰ The traditional subsistence economy, based on animal husbandry and field and garden cultivation, remains a dominant local livelihood strategy, despite the influences of a modern cash economy. Like many subsistence-based societies, the resident Xhosa-speaking people have a spiritual and utilitarian relationship with their environment.¹¹

Unemployment is amongst the highest in the country, with 65% of the population being unemployed. Educational levels are low. More than 50% of the households earned less than R5500 per annum in 2002, with up to a quarter of the households in the area having no source of formal income.¹¹ Seventy-eight per cent of households were below the poverty line, and 50% were regarded as 'ultra-poor'. Most households rely on a combination of government pensions and remittances from family members that have been able to find employment in the urban centres of South Africa. Up to 73% of the population had no access to sanitation services, with many households lacking access to clean water. Over 99% obtained their water from rivers and rain-water tanks, and 88% relied on paraffin as their main source of lighting.¹⁰

Considering the low socio-economic standing of this large, predominantly rural population, natural resources play an extremely important role in people's lives. The community relies heavily on traditional methods of health care.

Study methods

A dual approach was used, by combining participatory methods with conventional interviews and questionnaires. The

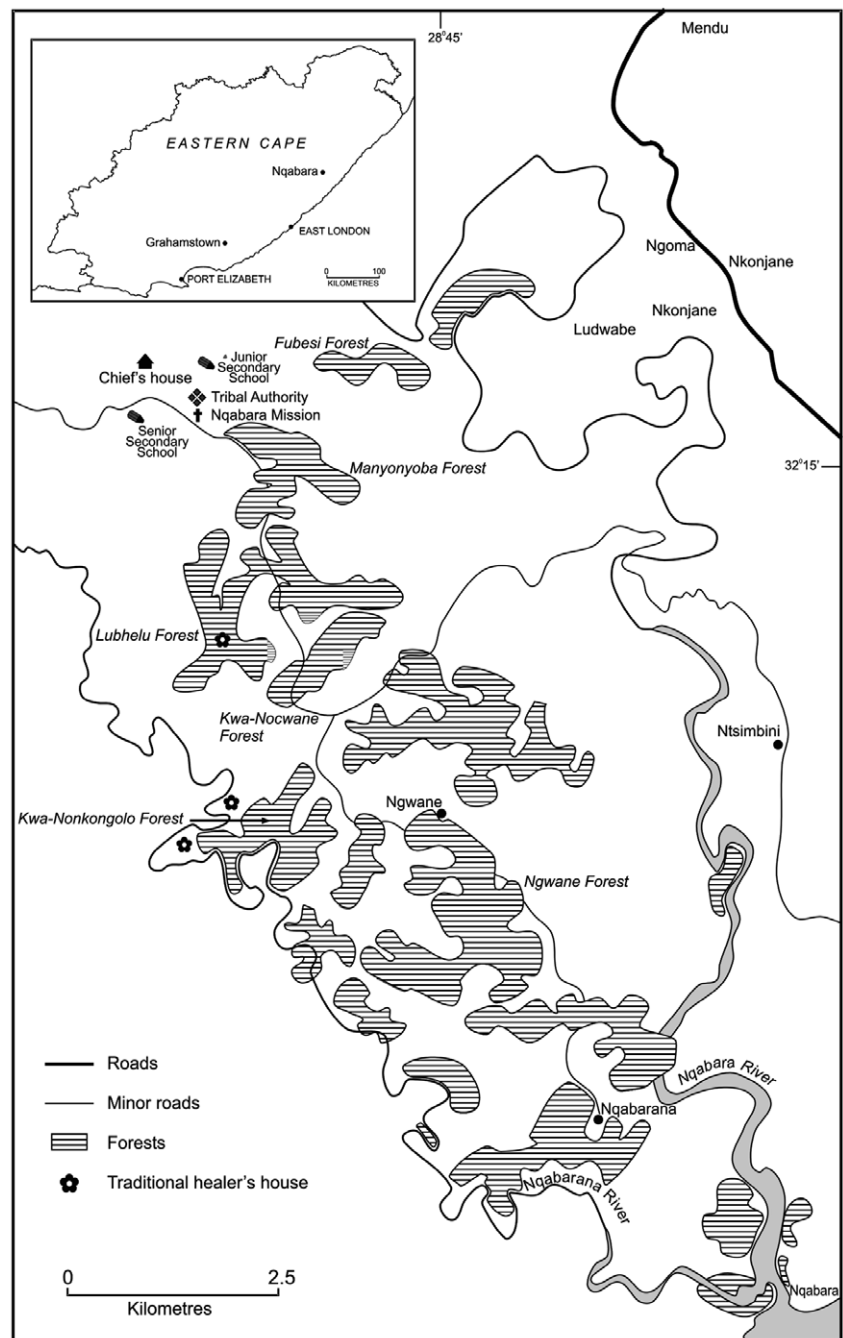


Fig. 1. Locality map of the Nqabara Administrative Area in the Eastern Cape province.

research team had, over a period of several years, built up a long-term relationship of trust and mutual respect with the local community by assisting them with planning, fund-raising and training for natural-resource management, as part of an integrated rural development strategy for the Mbashe area.¹⁰ For this component of the research, four field visits of five to seven consecutive days were conducted. Traditional healers and medicinal plant collectors living in the study area were invited to participate, while participation by other community members was voluntary.

Participatory Learning and Action (PLA) mapping^{16–18} was carried out with the

traditional healers. There are 10 traditional healers in the community, but only five were willing to participate in this research. Participants were asked to use coloured markers to draw a map of their local area on a sheet of newsprint. The next step was to plot the forests where medicinal plants were harvested, and this spatial information was then linked to a table of medicinal plant species found in each of the forests. The maps were validated by transect walks with traditional healers to verify the names, localities and medicinal plant composition of the forests. Specimens were collected for 'spot' identification at the Selmar Schonland Herbarium, located in the

Table 1. The 17 most important medicinal plants in the Nqabara Administrative Area, their rank, the mean time spent collecting them, their mean cost in the Mthata market, and local opinions about their suitability for cultivation.

Species	Xhosa name	Plant form	Part used by Nqabara traditional healers	Rank	Mean time spent collecting (min)	Mean market price in Mthata (R/g dry weight)	Suitable (S) or unsuitable (U) for cultivation (community perspective)
<i>Strychnos henningsii</i>	Umnonono	Tree	Bark	1	21	1.00	U
<i>Araujia sericifera</i>	Impinda	Climber	Roots	2	10	0.14	S
<i>Behnia reticulata</i>	Silawu esimhlophe	Climber	Tuber	3	15	0.10	S
<i>Protorhus longifolia</i>	Uzintlwa	Tree	Bark	4	30	0.05	U
<i>Stangeria eriopus</i>	Umfingwane	Woody suffrutex	Root	5	20	0.05	S
<i>Schotia latifolia</i>	Umgxam	Tree	Bark	6	30	0.04	U
<i>Rhoicissus digitata</i>	Chithibunga	Climber	Tuber	7	3	0.05	S
<i>Artemisia afra</i>	Umhloniyana	Herb	Leaves	8	5	0.05	S
<i>Pittosporum viridiflorum</i>	Umkhwenkwe	Tree	Stem bark	9	10	0.05	S
<i>Ilex mitis</i>	Isidumo	Tree	Bark and leaves	10	50	0.05	U
<i>Aloe ferox</i>	Ikhalu	Tree	Leaves and the rind	11	5	0.03	S
<i>Rhoicissus tridentata</i>	Chithibunga	Climber	Tuber	12	10	0.03	S
<i>Potamogeton thunbergii</i>	Ikhubalo ezithunzela	Aquatic herb	Leaves	13	5	0.03	S
<i>Acalypha glabrata</i>	Umqongci	Tree	Bark	14	15	0.50	U
<i>Schotia afra</i>	Umqongci	Tree	Bark	15	10	0.10	S
<i>Zanthoxylum davyi</i>	Mlungumabele	Tree	Bark	16	30	0.05	U
<i>Agapanthus africanus</i>	Umkhondo	Geophyte	Roots	17	30	0.02	U

Albany Museum, Grahamstown.

In addition, semi-structured interviews¹⁷ were conducted with the same traditional healers who participated in the PLA exercise. These interviews covered the issues of: the values placed on different medicinal plant species; their ease of cultivation; the stocks in the wild; and peoples' abilities to cultivate them. Such interviews had no fixed wording or ordering of questions, which allowed for flexibility, and enabled the researchers to seek clarification and elaboration on some of the answers given.¹⁹ Group interviews were conducted to stimulate discussion and to avoid creating mistrust amongst participants.²⁰ All the traditional healers who participated in this research were women. Throughout the interviews a Xhosa-speaking co-facilitator translated questions and responses between English and isiXhosa.

To obtain estimates of the relative importance that local users attached to the various plants, a ranking exercise¹⁷ was carried out with the five traditional healers. Participants were asked to rank the plant list obtained from the semi-structured interviews in order of importance, and to give reasons for their ranking.

The interviews and participatory exercises were supplemented by more formal questionnaire-based interviews, administered to the five traditional healers in the field. A data sheet containing a list, in isiXhosa, of the valuable medicinal plants obtained from the participatory exercises was drawn up. Respondents were asked to indicate whether they cultivated some of these species in their home gardens. Participants also had to provide reasons for their responses and there was space for remarks or comments. The questionnaires also required information about: the amount of time spent collecting a particular medicinal plant; how many

times they had made the trip in the past month or season; purpose for collection (commercial, personal, etc.); other plants that were collected during the same trip, and collection success at the site (did they find what they were looking for, was it in abundance?); and alternative harvesting sites.

The market prices of the plants were determined by visiting six trading stalls in a nearby urban centre (Mthata), recording the prices of the respective plants and determining their dry weights to obtain their market values. To ensure that plant parts identified in the markets were the same as those identified in the Nqabara AA, live specimens were taken to the trading stalls. The prices were standardized by calculating the price per gram of each species. Furthermore, plant parts were also bought from the Mthata trading stalls and, along with those collected in the field, identified at the Selmar Schonland Herbarium. It was important to ensure that the plant parts obtained from the Nqabara AA were the same ones obtained from the markets. Powdered and very dry material was avoided as it would have been too difficult to identify.

Results

Preferred medicinal plants. The most important medicinal plants in the Nqabara AA and their ranks are shown in Table 1. Each species had both a medicinal and a spiritual value, but the most valued plants had many different uses and strong medicinal properties. Most of the medicinal plants being used in the Nqabara AA appear to be woody species, possibly because the larger study¹⁰ focused mainly on indigenous forest management. Two of the top-rated plants were large trees, harvested for their bark, with *Strychnos henningsii* being regarded as the most important. The reasons participants gave

for ranking species were related to their use and potency, with spiritual and intangible uses also playing important roles.

Values of medicinal plants. Contrary to our expectations, the ranking of the plants and their market prices were independent of the time it took to collect them. Importance ranking was, however, correlated with the market price of plants (Table 1). There was a strong positive relationship between the inverse of the rank attached to medicinal plants and their prices in the market ($r = 0.78$, d.f. = 15, $P < 0.01$, Spearman's rank correlation). This suggests that plant healing properties, as inferred from people's subjective importance ranking of species, played an important role in determining the market price.

Preferred forests. The main forests visited by the traditional healers for harvesting were Manyonyoba, Lubelu, Ngwane and Unkongolo. The main reason given for preferentially collecting plants in a forest was proximity and accessibility. Most collectors chose to visit forests near their homesteads. Forests like Lubelu and Ngwane are close to most of the traditional healers' homes (75%) and are therefore intensively utilized. The preferred forests also had unique species; for example *Strychnos henningsii* (ranked the most important medicinal plant by the traditional healers) was most abundant in Ngwane forest. Secondly, users said that the ecological condition of the forest played a role in its selection for collecting. Forests with high species diversities such as Unkongolo and Manyonyoba were popular because healers were able to collect most of the species that they required in one locality. These high-diversity forests are, however, inaccessible and far from homesteads. Users therefore had to make trade-offs between a forest's accessibility and the variety of plants found there.

Table 2. Reasons why some medicinal plants are unsuitable for cultivation in medicinal plant gardens in the Nqabara AA, according to traditional healers.

Medicinal plant	Reasons for unsuitability
<i>Protorhus longifolia</i>	A big tree that consumes much water, takes up a lot of space and as a result shades out others; difficult to cultivate.
<i>Strychnos henningsii</i>	Fast and easy to grow; even so, it grows to a tall tree and consumes large amounts of water, especially in summer.
<i>Schotia latifolia</i>	A big tree that consumes much water; it is difficult to find viable seeds.
<i>Rhoicissus digitata</i>	Cultivation has been attempted in the past by some traditional healers in the Nqabara AA, who found that this species does not grow well when cultivated in gardens. It has a large and long-lived underground tuber.
<i>Zanthoxylum davyi</i>	Cultivation has been attempted but it does not grow well in gardens.
<i>Agapanthus africanus</i>	Said to lose its healing powers when cultivated in a garden.
<i>Acalypha glabrata</i>	Relatively difficult to find viable seeds.

Cultivation of medicinal plants. The traditional healers stated that most of the important medicinal plants could be cultivated in home gardens, and four of the five traditional healers cultivated some plants in their home gardens. The medicinal plants considered suitable for cultivation included *Araujia sericifera*, *Behnia reticulata*, *Stangeria eriopus*, *Ilex mitis*, *Artemisia afra*, *Pittosporum viridiflorum*, *Aloe ferox*, *Schotia afra*, *Rhoicissus tridentata*, and *Potamogeton thunbergii*. These species were being grown in all four gardens. The reasons given for their cultivation included the convenience of obtaining seeds in the wild, ease of cultivation, their modest water requirements and their low impact on vegetables and other garden plants. Some of the preferred medicinal plants were, however, considered to be unsuitable for cultivation. Reasons for this included: scarcity of propagating material; their high water needs; difficulties associated with propagation; their loss of healing powers when taken out of the wild; and their effect on vegetables in terms of their space requirements and the 'shading out' of other plants (Table 2). The medicinal plants with inadequate supplies of viable seeds, according to the healers, included *Acalypha glabrata*, *Strychnos henningsii*, *Schotia latifolia*, and *Protorhus longifolia*.

Steps taken to prevent over-harvesting. The Nqabara community and its leadership recognize the need to harvest medicinal plants sustainably from the forests, and have developed strategies and actions to reduce the impact of harvesting. Some of the strategies include:

Strengthening local institutions for forest conservation. A Participatory Forest Management (PFM) committee was elected by the Nqabara AA community. The committee is active and meets regularly.

Developing a long-term conservation strategy. The Nqabara community also drew up a Conservancy Management Plan in 2004. The boundaries of the community conservancy were mapped through participatory mapping and incorporated in a Geographic Information System (GIS), and rules for the harvesting of the various forests were formulated and accepted.

Raising funds for forest conservation projects. A R2.5 million poverty-relief grant for landscape restoration has been allocated to the Nqabara community by the Department of Environmental Affairs and Tourism.

Initiating nature-based enterprises to fund conservation activities. A craft production project, a medicinal plant nursery and a nature-based tourism project were begun in 2004.

Strengthening international, national, provincial and local networks. The Nqabara community has created and fostered links with government departments (Department of Water Affairs and Forestry, DWAF), the Mbhashe municipality, international aid agencies (the German technical cooperation agency, Transform) and an academic institution (Rhodes University). These organizations facilitate rather than lead community initiatives and assist with fundraising.

Discussion

The ranks attached to the six most valuable medicinal plants not only took into consideration the strength of a plant's healing properties, but also its market price. The Nqabara traditional healers consider species with strong healing properties and a high market price to be valuable. However, their ranking of plants is independent of the time taken to collect plant material in the forests. A species such as *Rhoicissus digitata* takes the collectors 50 minutes on average to gather and costs five cents per gram on the market, whereas *Araujia sericifera* takes an average of 10 minutes to collect, but costs 14 cents/g in the Mthata market. *Stangeria eriopus* is as easy to collect as *A. sericifera* but is ranked fifth, and costs only 5 cents/g in Mthata.

Species rankings were unrelated to conservation status. *Araujia sericifera* is an alien invasive plant introduced from Peru and listed under category 1 of the amended regulations of the Conservation of Agricultural Resources Act 43 of 1983. *Stangeria eriopus*, on the other hand, is listed under appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which means that it is threatened with

extinction or may be affected by trade.

The medicinal plants that are becoming scarce are often difficult to cultivate, due in part to a shortage of propagating material. *Acalypha glabrata* is one of the least abundant plants found in the area, and the traditional healers find it difficult to cultivate this species in home gardens because it is hard to find the seeds to propagate. As a result, the healers generally prefer to collect material from these species in the forest.

The willingness to cultivate plants is also to some extent linked to their frequency of use. For example, species such as *Pittosporum viridiflorum* and *Artemisia afra*, used to treat common colds and fever, respectively, are being cultivated in most gardens in the Nqabara AA, because these species are in high demand, often at night, and it is therefore desirable to have easy access to them.

The average time spent in the forests collecting medicinal plants varied amongst the traditional healers interviewed. Even though some collectors sought a diversity of species and visited more forests, the time spent collecting also depended on the part of the plant being used in medicinal practice. Species such as *Protorhus longifolia*, *Strychnos henningsii* and *Schotia latifolia*, where the bark is the main part utilized, tended to take longer to collect. These particular species are slow-growing and in relatively short supply owing to high demand.²¹

All the traditional healers who participated in this research were unemployed women who do not have alternative sources of income. They acknowledged that most medicinal plants, but particularly large trees exploited for their bark, were becoming scarcer. The declining supply of indigenous medicinal plants and associated products is likely to lead to significant economic and welfare losses, in view of the large number of people consuming these plants.⁴ Such losses include missed opportunities to capitalize on the growing local and international demand for medicinal plants.^{24,25}

The medicinal plants considered unsuitable for cultivation tended to be trees, valued mostly for their bark, such as *Strychnos henningsii*, *Protorhus longifolia*,

Schotia latifolia and *Schotia afra*. These species also have the lowest abundance in the area and heavy harvesting of bark from species with a high market demand (e.g. *Strychnos henningsii*) often results in ring-barking.²² The trees subsequently die and so become scarcer. This practice could result in the extinction of many forest and woodland tree species.²³ Some of the healers did, however, monitor individual trees for signs of over-harvesting and adapted their collection activities to ensure the continued health of the tree.

While there is evidence of community-based conservation at Nqabara, commercial medicinal plant cultivation has only recently taken off, with the assistance of DWAF. Before this, the traditional healers in the area doubted that they had the necessary skills to run medicinal plant nurseries. The main reasons appear to be insufficient knowledge of the economics of plant production and associated markets, which limits cultivation initiatives, as does a lack of institutional support.⁴ Second, people lack the start-up capital for full-scale plant production. This includes money for fencing to protect the plants from problem animals such as bush pigs, which are abundant in the area. Third, there appears to be lack of suitable land, and water shortages. Most households in the study area use run-off water from roofs that is stored in tanks, or water from streams. Lastly, healers and collectors believe there are still sufficient resources in the wild, and that cultivation is therefore unnecessary.

More and better-funded programmes must be put in place to facilitate cultivation of medicinal plants. Awareness has to be raised among traditional healers, collectors and traders to ensure that they have the correct permits and also observe the permit conditions. In order to conserve these species in the long term, their value needs to be recognized by land users, who are being encouraged to propagate priority species and to use medicinal plants on their properties sustainably.⁴ Species recovery plans must be formulated for all priority plant species. These plans should aim to ensure survival of viable wild populations of each species. Furthermore, these plans should be species specific and include aspects such as artificial propagation for re-introduction into the wild and formulating strategies for sustainable wild harvest.

In the Nqabara AA, two groups of species should be prioritized for cultivation. The first group is those that the traditional healers find easy to cultivate and also have a high market demand, such as *Stangeria eriopus*, *Behnia reticulata*, *Rhoicissus digitata*, *Artemisia afra* and *Pittosporum*

viridiflorum. *Araujia sericifera* also falls in this category, but is an invader and abundant enough to be harvested from the wild. The second category consists of species such as *Acalypha glabrata*, which are difficult to cultivate because of inadequate seed supplies and are therefore locally threatened, but can be easily grown from slips. These species need to be grown in nurseries and replanted in the forests. To complement cultivation of adaptable species, harvesting from the wild must be guided by inventories and knowledge of the species concerned. Above all, overexploitation of rare and endangered species must be prevented through supporting local conservation initiatives.

There are many gaps in our knowledge of the present consumption and projected future demands, as well as trade statistics, for the large number of medicinal plants that are locally used and that supply local, and even international markets. In the absence of such information, informed decision-making and planning by industry, policy-makers, medicinal plant producers and research and development organizations is severely restricted. There is a critical need to compile, and make such information widely available. Marketing organizations, commercial phytomedicine producers, government agencies, and research institutions all have important roles to play in this regard. This article is based on an assessment conducted over a relatively short period with a small number of respondents. More in-depth research is needed on the harvesting techniques used by traditional healers, their storage of plant parts, their cultivation methods and their exchange of plant propagules.

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1. Dold A.P and Cocks M.L. (2002). The trade in medicinal plants in the Eastern Cape Province, South Africa. *S. Afr. J. Sci.* 98, 589–598.
2. Mander M. (1997). *Medicinal Plant Marketing and Strategies for Sustaining the Plant Supply in the Bushbuckridge area and Mpumalanga Province*, chap. 1, pp. 5. DANCED/Department of Water Affairs and Forestry, Nelspruit.
3. Williams V. (1996). The Witwatersrand muti trade. *Veld and Flora* 82, 12–16.
4. Mander M. (1998). *Marketing of Indigenous medicinal Plants in South Africa — A case study in KwaZulu-Natal*, chap. 3, p. 151. Food and Agriculture Organization, Rome.
5. Dlisani P.B and Bhat R.B. (1999). Traditional health practices in Transkei, with special emphasis on maternal and child health. *Pharm. Biol.* 37, 20–25.

6. Cocks M. and Moller V. (2001). *Use of Indigenous and Indigenous Medicines to Enhance Personal Well-being: A South African case study*, chap. 1, pp. 1–11. Institute of Social and Economic Research, Rhodes University, Grahamstown.
7. Nichols G.R. (1990). Making the medicinal plants renewable: a conservation strategy in the Durban city parks department. In *Proc. 12th Plenary meeting of the Association for Taxonomic Study of the Flora of Tropical Africa, Hamburg, Germany*, ed. A.B. Cunningham, pp. 979–990. Association for the Taxonomic Study of the Flora of Tropical Africa.
8. Cunningham A.B. (1992). *Imithi isizulu: The traditional trade in Natal/KwaZulu*, chap. 1, pp. 15–30. University of Natal, Pietermaritzburg.
9. Mander M., Mander J. and Breen C. (1996). Promoting the cultivation of indigenous plants for markets: Experiences from KwaZulu-Natal, South Africa. *Institute of Natural Resources Occ. Pap.* 167, p. 12. Institute of Natural Resources, Pietermaritzburg.
10. Mafa Environment & Development (2003). *Feasibility Assessment of PFM Projects in the Nqabara Administrative Area*. GTZ Transform, Danida and Department of Water Affairs and Forestry, Pretoria.
11. Palmer R., Timmermans H. and Fay D. (2002). *From Conflict to Negotiation: Nature-based development on South Africa's Wild Coast*, chap. 3, pp. 334. Human Sciences Research Council, Pretoria.
12. Acocks J.P.H. (1988). *Veld Types of South Africa*, 3rd edn. *Memoirs of the Botanical Survey of South Africa*. Pretoria.
13. Low A.B. and Rebello A.G. (1996). *Vegetation of South Africa, Lesotho and Swaziland*. Department of Environmental Affairs and Tourism, Pretoria.
14. Maud R. (1996). The Marco-geomorphology of the Eastern Cape. *The Geomorphology of the Eastern Cape*, ed. C. Lewis, pp. 1–19. Grocott and Sherry Publishers, Grahamstown.
15. Timmermans H and Naicker K. (2002). The land. In *From Conflict to Negotiation: Nature-based development on the South African Wild Coast*, eds R. Palmer, H. Timmermans, and D. Fay, pp. 378. Human Sciences Research Council, Pretoria.
16. Bawa K.S. and Gadgil M. (1997). Ecosystem services in subsistence economics and conservation of biodiversity. In *Nature's Services — Societal dependence on natural ecosystems*, ed. C.G. Daily, pp. 295–310. Island Press, Washington, DC.
17. Case D.D. (1990). *The Community's Toolbox: The idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry*, chap. 1, pp. 7–10. Food and Agriculture Organization, Rome.
18. Friere P. (1973). *Research Methods in Studies in Adult Education*, chap. 1, pp. 6–15. Institute of Adult Education, University of Dar es Salaam, Tanzania.
19. Martin G. (1995). *Ethnobotany: A methods manual*, chap. 1, pp. 5–20. Chapman & Hall, London.
20. Oakley P. and Marsden D. (1984). *Approaches to Participation in Rural Development*, chap. 3, pp. 91–94. International Labour Organization, Geneva.
21. McKean J.R., Johnson D.M. and Walsh R.G. (1995). Valuing time in travel cost demand analysis: An empirical investigation. *Land Econ.* 71, 96–105.
22. Ellis C.G. (1986). Medicinal plant use: a survey. *Veld and Flora* 72, 83–98.
23. Gelfand M., Mavi S., Drummond R.B. and Ndemera B. (1985). *The Traditional Medicinal Practitioner in Zimbabwe*, chap. 2, pp. 40–45. Mambo Press, Harare.
24. Cunningham A.B. (1988). An investigation of the herbal medicine trade in Natal/KwaZulu. *Institute of Natural Resources Rep.* 29. Institute of Natural Resources, University of Natal, Pietermaritzburg.
25. Lange D. (1997). The trade in plant material for medicinal and other purposes: a German case study. *Traffic Bull.* 17. TRAFFIC International, Cambridge.