KNOWLEDGE AND USE OF TRADITIONAL MEDICINAL PLANTS BY THE SETSWANA-SPEAKING COMMUNITY OF KIMBERLEY, NORTHERN CAPE OF SOUTH AFRICA

CHARLOTTE M MONAKISI

Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science (Ecological Assessment) at the University of Stellenbosch

SUPERVISOR: Prof KJ Esler

CO-SUPERVISOR: Prof D Ward

December 2007

DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: é é é é é é é Date:é é 4 October 2007é é é

SUMMARY

The majority of South Africans still depend on the use of traditional remedies, as these are sometimes the only types of health care systems available, especially within rural communities. South Africa comprises approximately 400 000 traditional healers and an estimated 60 to 80% of individuals consulting such traditional healers. As a result, the over-harvesting of many traditional medicinal plants has become a threat to the countryôs species diversity and has resulted in the scarcity of certain medicinal plant species.

The non-sustainable use of traditional medicinal plants stems from their intense harvesting from the wild to supply the high demands from urban and rural markets. As a result of the escalating population growth rate; high rural unemployment; and fundamental value attached to traditional medicinal plants (socio-economic factors), the national and regional trade of traditional medicines is currently higher than it has ever been. Another reason for the increased threat to traditional medicinal plants is the degradation and weakening of customary laws that have previously regulated such resources.

This study focuses on the use of traditional medicinal plants by the Setswana-speaking community for self-medication and as a form of primary health care. Research was conducted in Kimberley, Northern Cape of South Africa and focuses on the issue of the sustainability of medicinal plant use in the area, specifically on use and users as well as the acquisition of material sold by a single trader and harvesting techniques. This is to determine whether harvesting of medicinal plants is a potential threat to plant communities in the area. To address the shortcomings of medicinal anthropology the study also investigates the impacts of relocation and resettlement of various communities in the area, on plant use, methods of collection, the sustainability of the natural resource, as well as the transmission of Setswana indigenous knowledge inter-generationally.

ditional medicinal plants still plays a major role in iduals queried continue to use traditional remedies as part of their culture and tradition. A diverse array of plant material was traded. Although some material was collected locally, most of the material was collected and imported from other parts of the country and in some cases from surrounding countries such as Lesotho and Swaziland. Although most of the material traded was not collected locally and thus not specific to this particular study, it represented harvesting and sustainability issues in other parts of the country.

The herbalist traded a total of 79 traditional medicinal plants, some of which are protected and under significant threat of extinction, these included *Prunus africana* and *Warburgia salutaris* limited to protected areas around the country. *Prunus africana* is a listed species in CITES Appendix 2. Other threatened species included *Ocotea bullata, Bersama lucens, Curtisia dentata* and a *Eugenia* species.

Most of the plants harvested (in Kimberley) were in the form of underground storage organs (resprouters and bulbs). Although these growth forms can recover from stem damage and the damage of underground storage organs, they are poor colonisers if over-utilised and over-exploited and, as a result, numbers can decline over time. In this study, a reflection of the decline in plant populations over time is indicated by the increase in travelling distances to collection sites. This was however, not reflected by the changes in price and quantity of material traded over the past century. The majority of individuals proclaimed that the price and quantity of material traded had remained comparatively stable over time

Of the target species investigated for vulnerability or sensitivity to disturbance, *Withania somnifera, Boophane disticha, Dicoma anomala* and *Bulbine natalensis* indicated the lowest survival potential and the highest sensitivity to disturbance. Most of these species indicated low densities across the selected sites. However, in the case of *Withania somnifera,* the negative results were associated with the low rainfall season experienced during that year. The species is generally classified as a weed of disturbed areas and is

nces. Certain species reacted positively to disturbance sturbed habitats. These included *Elephantorrhiza elephantina* and a *Helichrysum* sp.

To minimise destructive harvesting in the Kimberley area and to ensure the sustainable harvesting of plant material, it is important that local harvesters are educated on proper harvesting techniques and that local gatherers are educated on sustainability issues as well as other ecologically fundamental issues.

OPSOMMING

Die meeste Suid-Afrikaners is steeds afhanklik van tradisionele geneesmiddels aangesien dit soms, veral in landelike gemeenskappe, die enigste beskikbare gesondheidsorg is. Suid-Afrika het sowat 400 000 tradisionele geneeshere wat deur ôn geraamde 60% tot 80% van individue geraadpleeg word. As gevolg hiervan hou die oorontginning van talle tradisionele medisinale-planthulpbronne ôn bedreiging vir die land se spesiediversiteit in en het dit reeds tot ôn skaarste aan sekere medisinale plante gelei.

Tradisionele medisinale plante word tans nievolhoubaar aangewend aangesien dit op groot skaal in die veld geoes word om in die groot vraag van stedelike en landelike markte te voorsien. As gevolg van die stygende bevolkingsgroeikoers, hoë landelike werkloosheidsyfer en die grondliggende waarde wat aan tradisionele medisinale plante geheg word (sosio-ekonomiese faktore), is die nasionale en streekhandel in tradisionele geneesmiddels tans groter as ooit tevore. Nog ôn rede vir die toenemende bedreiging van tradisionele medisinale plante is die verslapping en versagting van gewoontereg-wetgewing wat voorheen sodanige hulpbronne gereguleer het.

Hierdie studie fokus op die gebruik van tradisionele medisinale plante deur die Setswana-gemeenskap vir selfbehandeling en as ôn vorm van primêre gesondheidsorg. Die navorsing vir die studie is in Kimberley in die Noord-Kaapprovinsie van Suid-Afrika gedoen en fokus op die kwessie van volhoubare medisinale-plantgebruik in die gebied, met bepaalde klem op gebruik en gebruikers, die verkryging van middels wat deur ôn enkele handelaar verkoop word, en oestegnieke. Die doel van die navorsing was om te bepaal of die oes van medisinale plante ôn moontlike bedreiging vir plantgemeenskappe in die gebied inhou. Om die tekortkominge van medisinale antropologie aan te pak, ondersoek die studie ook die uitwerking van die verskuiwing en hervestiging van verskeie gemeenskappe in die gebied op plantgebruik, oesmetodes, die volhoubaarheid van die natuurlike hulpbronne, asook die oordrag van inheemse Setswana-kennis oor geslagte heen.

n tradisionele medisinale plante speel steeds ôn groot meeste van die individue wat aan die navorsing deelgeneem het steeds tradisionele geneesmiddels as deel van hulle kultuur en tradisie gebruik. Daar word in ôn uiteenlopende verskeidenheid plantmateriaal handel gedryf. Hoewel sommige van die middels plaaslik ingesamel word, word die meeste van ander dele van die land, en in party gevalle van buurlande soos Lesotho en Swaziland, ingevoer. Hoewel die meeste van die materiaal dus nie plaaslik ingesamel word en dus nie bepaald op hierdie studie betrekking het nie, is dit steeds aanduidend van oes- en volhoubaarheidskwessies in ander dele van die land.

Die kruiekenner dryf in sewentig tradisionele medisinale-plantsoorte handel, waarvan party beskermd en erg bedreig is, waaronder *Prunus africana* en *Warburgia salutaris* wat slegs in beskermde gebiede in die land voorkom. *Prunus africana* is ôn gelyste spesie in CITES, aanhangsel 2. Ander bedreigde spesies sluit *Ocotea bullata, Bersama lucens, Curtisia dentata* en ôn *Eugenia*-spesie in.

Die meeste van die plante wat (in Kimberley) geoes word, is in die vorm van ondergrondse bergingsorgane (uitlopers en bolle). Hoewel hierdie plante van stingelskade en die skade aan ondergrondse bergingsorgane kan herstel, vat hulle swak pos indien hulle oorgebruik en oorontgin word, en kan hulle dus mettertyd al hoe minder voorkom. In hierdie studie word die mettertydse afname in plantbevolkings deur die toename in reisafstande na insamelingspunte aangetoon. Hierdie tendens is egter nie in die handelsprys en -materiaalhoeveelhede oor die afgelope eeu weerspieël nie. Die meeste van die studiedeelnemers het bevestig dat die prys en hoeveelheid van die handelsmateriaal deurentyd betreklik stabiel gebly het.

Van die teikenspesies wat vir kwesbaarheid of sensitiwiteit vir ontwrigting ondersoek is, het *Withania somnifera, Boophane disticha, Dicoma anomala* en *Bulbine natalensis* die laagste oorlewingspotensiaal en die hoogste ontwrigtingsensitiwiteit getoon. Die meeste van hierdie spesies het in baie klein hoeveelhede op die gekose terreine voorgekom. In die geval van *Withania somnifera* kon die negatiewe resultate egter met die

ie betrokke jaar in verband gebring word. Hierdie
n onkruid in ontwrigte gebiede geklassifiseer en kom meestal onder erg ontwrigte toestande voor. Sekere spesies, soos *Elephantorrhiza elephantina* en ôn *Helichrysum*-spesie, het positief op ontwrigting gereageer en het volop in ontwrigte habitatte voorgekom.

Om vernietigende oestery in die Kimberley-omgewing te minimaliseer en die volhoubare ontginning van planthulpbronne te verseker, is dit belangrik dat plaaslike plukkers in gepaste oestegnieke, en plaaslike insamelaars oor volhoubaarheidskwessies en ander ekologies belangrike sake opgelei word.

NOWLEDGEM ENTS

A huge thanks to the following people: The Rastafarian herbalist, for his time, patience and exceptional knowledge of traditional medicinal plants; Errol and Barbara Tegg for their hospitality and accommodation offered; the NRF for providing a scholarship that made the study possible; my supervisor Prof Karen Elser and co-supervisor Prof David Ward for their help, patience and effort and last but not least my classmates, family and friends for their support and understanding.

BLE OF CONTENTS

IST OF FIGURES

LIST OF TABLES

OF APPENDICES

CHAPTER ONE

GENERAL INTRODUCTION

1.1 General Introduction

The majority of South Africans still depend on alternative forms of medication, as these are sometimes the only type of health care systems available, especially within rural communities. South Africa comprises approximately 400 000 traditional healers and an estimated 60 to 80% of individuals currently consult these traditional healers (Iwu 1993, Meyer and Afolayan 1995, Jäger et al. 1996, van Wyk et al. 1997, Mander 1998, Yield 2002, Springfield et al. 2005, Diederich 2006). However, the over-harvesting of many traditional medicinal plants has become a threat to the countryôs species diversity and has resulted in the endangerment of certain medicinal plant species.

This study focuses on the use of traditional medicinal plants by the Setswana-speaking community for self-medication and as a form of primary health care. Research was conducted in Kimberley, Northern Cape of South Africa and focuses on the issue of the sustainability of medicinal plant use in the area. This is to determine whether harvesting of medicinal plants is a potential threat to plant communities in the area. The study also takes a closer look at the transmission of indigenous knowledge between generations and threats governing such knowledge and practices, as well as the implications of relocation on such transmission and resource use.

Research was conducted in two phases, which determine the layout of this thesis. Chapter two (Phase one) deals with resource use as well as the profiles of the resource users and chapter three (Phase two), with sustainability issues governing such use. A recommendations chapter (four) provides possible solutions to challenges encountered during the course of the study and highlights key messages as well as recommendations for future studies. Phase one of the research used a questionnaire, participatory

identification to document plant species used by the onducted over a two-week period and a total of 89 individuals were interviewed randomly. Phase two was conducted over a two-week period and included vegetation sampling and participatory observation of various plant collectors, noting collecting methods and areas of collection.

1.2 Broad rationale

Despite urbanization, medicinal plants still play a vital role in the lives of many South Africans and play a significant role in the countryôs economic sector. The majority of South Africans still depend totally or partially on traditional methods of healing, as this is often the only type of health care system available to rural communities and is more accessible than western medicines (Shale et al. 1999, Shrestha and Dhillion 2003, Steenkamp 2003, Verschaeve et al. 2004). Most Africans, including those from urban communities, continue to consult traditional healers especially when confronted with serious chronic diseases that seemingly defy western medicines (Elvin-Lewis 2001). The ease of accessibility, preparation and usage, is what has kept traditional plant medication going, even under high dynamism presented by todayôs world. The alternative form of medication is relatively cheaper than western medicines (Grierson and Afolayan 1999). It caters to poor communities and to individuals that cannot afford western medicines in undeveloped rural areas, especially in areas where health care services are inefficient and insufficient (Zschocke et al. 2000).

Over the past century, the use of traditional medicinal plants has broadened from the activity of specialists, such as traditional healers and herbalists, to a booming trade that includes hawkers and gatherers (van Warmelo 1991). Trade in medicinal plants plays an important part in the internal economy of the country. The informal trade of medicinal plants within southern Africa is comprised of approximately 400 000 and 500 000 traditional healers, selling crude (unprocessed) traditional medicinal plants (Mander and Breton 2006). More than 1 000 species of medicinal plants are traded (Mander and Breton 2006). In Durban alone, medicinal plant trade was valued at approximately R100

£60 million per annum in 1998 (Mander 1998) and a is traded (Mander et al. 2006).

The explosive increase in human population and deteriorating living standards has resulted in many people turning to alternative (i.e. other than western medication), cheaper forms of medication. The escalating human population, resulting in a fast increase in informal trade, has caused the management of traditional medicinal plants to become a topic of major urgency (Cunningham 1991). The indigenous use of traditional medicinal plants, coupled with the countryôs extremely rich floral (over 30 000 plant species, 24 300 higher taxa, de Wet 1993 and Diederich 2006) and cultural diversity, makes it extremely important to understand the sustainable use of medicinal plant products. Over-harvesting and improper harvesting methods are of major concern in South Africa and have significant implications for biological diversity, posing a threat to many plant species (Cunningham 1991).

In summary, over-harvesting as a result of thriving market trades is due to three main factors: (1) The rapid population growth of urbanized black South Africans, still dependent on medicinal plants. In the Durban area alone the population increases at a rate of 9% per annum and an estimated 80 to 85% of the population is dependent on medicinal plants for health care (van Warmelo 1991); (2) Traditional medicines are more accessible, cheaper and more numerous than western medicine (Mander 1998). The increase in population numbers, coupled with increased urbanization and industrialization, has resulted in a decline in the distribution of most medicinal plants; (3) Plant markets present good income opportunities to gatherers and herbalists, mainly due to the high unemployment rate and low levels of formal education (van Warmelo 1991, Mander 1998). These factors over the years have resulted in a change in medicinal plant use from the specialist activity of traditional medicinal practitioners to a commercial trade involving many informal street traders.

Use of traditional medicines is dependent on two main factors, plant species diversity, and the indigenous knowledge (arising from culture) that governs such practices (Sheldon

t in medicinal plant diversity has been the degradation s and indigenous knowledge that in the past has regulated the use of these natural resources (Hamilton 2004). Currently, traditional knowledge is being lost to modernization (Raja et al. 1997, Grierson and Afolayan 1999) and westernization, and is slowly being lost from generation to generation without documentation (Shrestha and Dhillion 2003, Hamilton 2004). However, transfer of knowledge through upbringing and word-of-mouth (the acquisition of indigenous knowledge from individuals other than family) has ensured the survival of traditional medicinal plant knowledge to modern times (Panter-Brick et al. 2001).

The countryôs floral and ethnic diversity is of high conservation priority and should be conserved. However, this is not the case. In many countries, traditional conservation practices have been weakened by cultural change (Crawhall 1999) and increased human needs and numbers. It is important to understand and document such knowledge especially in relation to different ethnic groups.

The acculturation of cultures and loss of indigenous knowledge can also be attributed to the relocation or resettlement patterns. The relocation of individuals resulting from industrialisation and urbanization can culminate in overexploitation and the practice of improper harvesting techniques as individuals are exposed to different environments and habitats. The issue of resettlement also poses a threat to traditional plant conservation and requires scientific attention. South Africa, like most countries faced with transformation, has cultures under continual change, adapting and adjusting to those of surrounding ethnic groups (Cockerton 1996, Raja et al. 1997, Grierson and Afolayan 1999, Elvin-Lewis 2001, Panter-Brick et al. 2001). In this study, the effects of relocation on traditional plant use and harvesting in Kimberley are investigated.

Extensive literature is available on the use of traditional medicinal plants in general, with particular emphasis on Nguni culture, especially within the Zulu-speaking people (Watt and Breyer-Brandwijk 1962, Hutchings et al. 1996, van Wyk et al. 1997, Cunningham 1998, Mander 1998, Kelmanson et al. 2000, Van Wyk and Gericke 2000, Cocks and

eward and Cole 2005, Thring and Weitz 2005). Such cluding Nguni history, culture, and organization of settlements, traditions, traditional medicinal plant use and food. However, very little research has been conducted on indigenous knowledge within the Sotho culture and specifically within the Setswana group.

This study is a first attempt to focus on the Setswana-people and their use of traditional medicines. Although topics on sustainable harvesting and sustainable development are subject to extensive research and debate (Cunningham 1990, Cunningham 1991, Mander 1997, Pfab and Scholes 2004, Steward and Cole 2005), insufficient information has been documented in relation to the Setswana group. Kimberley was chosen as a study area as this urban area also allows for the investigation of other fundamental issues such as the effects of relocation (associated for example with migrant mine workers) and harvesting on plant use in the area.

1.3 General aims and objectives

The general aim of the thesis is to document the use of traditional medicinal plants by the Setswana community. Secondly, it is to study the effects of relocation on Setswana traditional medicinal plant knowledge and use. Thirdly, the aim is to (i) note harvesting techniques used by the indigenous group and to determine if such methods are sound environmental practices, promoting sustainability, or are causing the degradation of natural resources (Chapter 2); (ii) identify medicinal plants used (Chapter 2) and outline plant geographic distribution and assess abundance (Chapter 3); and (iii) to identify which medicinal plants are threatened in the wild to give them high priority in conservation programs around Kimberley (Chapter 3).

chapter are to provide background to:

- Traditional plant use in South Africa;
- Setswana culture and tradition;
- Effects of relocation; and
- Sustainability issues.

Specific aims and objectives of chapter two are to:

- Gather data on herbal plant preparation, frequency of use and reasons for purchasing (as opposed to collecting from the wild).
- Document a list showing a general identification of resources used and reasons for use (Appendix 2);
- Gather information on the resource users (key groups), specifically interested in poor resource users, their personal profiles;
- Research the inter-generational transfer of indigenous knowledge and use of traditional medicines. Is the root of knowledge upbringing and culture or do other factors play a role?
- Investigate whether relocation has any implications on cultural changes, resulting in the acculturation of cultures to form uni-cultures in the long run.

Specific aims and objectives of chapter three are to:

- Investigate plant material traded (plant parts used) to note if species are harvested in a sustainable manner;
- Investigate price changes and changes in quantity of material traded, as measures of resource availability and sustainability;
- Investigate the effects of harvesting on sustainability. This is investigated at both local (plants harvested in the area) and national level (through market trade i.e. various material traded were from other areas in South Africa); and
- Investigate the survival potential of species collected in the Kimberley area, to note if any of the species are vulnerable to over-exploitation.

om the study; and

- To provide possible sources of error, solutions to challenges encountered during the course of the study, as well as recommendations for the future.

1.4 Study area

The study was conducted in Kimberley, Northern Cape of South Africa. Annual rainfall in this semi-arid region of South Africa is approximately 388 mm per annum. Minimum temperatures can reach a low of -10ºC during the winter months and a high of 40ºC in the summer months (Kraaij and Ward 2000).

The vegetation type in the area of study is Savanna woodland (known as Kimberley Thorn Bushveld, Low et al. 1996) and is characterised by a continuous herbaceous layer, consisting of grasses and sedges and a woody layer of trees and shrubs (Skarpe 1992). Species diversity and abundance within the habitat is determined by abiotic factors such as moisture, soil depth, types of soils as well as inter-specific and intra-specific competition for such natural resources (Skarpe 1992). Disturbances such as herbivory and fire also play a fundamental role in determining grass:tree ratios (Skarpe 1992) and can result in bush encroachment. Bush encroached areas are comprised of a dense canopies, mainly tree and shrub species.

The dominant tree species are *Acacia erioloba* E. Mey and *Acacia tortilis* Hayne subsp *heteracantha* (Burch.) (Kraaij and Ward 2000). Abundant shrub species include *Acacia mellifera* (Vahl) Benth. subsp. *detinens* (Burch) Brenan, *Tarchonanthus camphoratus* L. [*T. minor* Less.] and *Grewia flava* DC. Bush-encroached areas also have numerous grass species, *Stipagrostis* and *Eragrostis* being the most abundant. Other shrub species include *Pentzia* and *Chrysocoma*. The grassy pans that intersperse the area comprise of low-lying vegetation and trees and shrubs are absent. The dominant plant genera are *Thesium*, *Pteronia*, *Pentzia*, *Chrysocoma* and *Salsola*.

Kimberley has a population of approximately 2 million, 48% are females and 52% males (Stats SA, Census data 2001). For the purposes of this study, emphasis is placed on the African black communities, as they are the main purchasers and users of traditional herbal plants. Of the total population in Kimberley, 52% is African black, and 31% mixed blood (so called ñcolouredò) of which 68% speak Afrikaans and 21% Setswana. The Northern Cape has the highest unemployment rate, at 20% of the total population in South Africa, coupled with the lowest level of education (Stats SA, Census data 2001). Eighteen percent of individuals older than the age of 20 have no schooling, 21% have some primary school education, 30% some secondary school education and only 6% have any form of higher education (Stats SA, Census data, 2001).

1.6 Literature review

1.6.1 History of traditional medicinal plant use in South Africa

Indigenous knowledge and the traditional use of medicinal plants dates back centuries, fossils date use of traditional plants to approximately 60 000 years ago (Fabricant and Earnsworth 2001). Traditional or indigenous knowledge has been acquired over thousands of years from the direct relationship and dependency of humans on the environment and its natural resources in providing food, shelter and medicine. Such knowledge has been transferred between generations (Laws et al. 1995, Springfield et al. 2005) in the form of social attitudes, beliefs, principles, behaviours and historical experience. The history of use of traditional plants is evident in the history of many South African cultures and ethnic groups. Various journals have documented the early use of plants for medicinal purposes, particularly by the countryôs earliest inhabitants, the San (Vayda 1969). Of the plants used by the San (an indigenous group also present in the Kimberley area), approximately 40 species were used for medicinal purposes (Smith et al. 2000).

ame the influential penetration of western medicines traditional medicine (Cocks and Dold 2000), thus eroding existing traditions and cultures of ethnic groups such as the San. Failure to respect indigenous knowledge and culture over the years resulted in the initiation of alien technologies that often undermined local peopleôs confidence (Shelton and Katrinka 1993), marginalizing and alienating indigenous communities.

Post colonization, mass urbanization with the discovery of gold resulted in further emphasis and promotion of western medication and the undermining of traditional medicine. The dynamic world presented by urban areas attached a stigma to indigenous knowledge and practices as they were seen as primitive (Iwu 1993). An increasing number of cultural groups have turned to western medicine. However, such knowledge continued to thrive in the rural areas where cultural practices were still an integral part of every day life. The use and knowledge of traditional medicine remained dormant and seemingly non-existent to the western world until the 1950s (Cocks and Dold 2000). At this time, cultural anthropologists began to recognize indigenous forms of healing practices and their relation to culture (Cocks and Dold 2000). This line of study later became known as ethnomedicine, the study of non-western medicine.

Currently more than a 1000 species of South African plants are used for medicinal purposes (Mander and Brenton 2006) and approximately 147 plant families are traditionally used for healing purposes by the Zulu, Xhosa and Sotho people of South Africa (Louw et al. 2002). This includes many introduced plants that over generations have been incorporated into South African traditional medicine, such as Dutch, Indian and Chinese medicinal plants (Cocks and Dold 2000, van Wyk and Gericke 2000). Some introduced species include *Glycyrrhiza glabra* (liquorice), *Ruta graveolens* (rue), *Zingiber officinalis* (ginger) and *Acorus calamus* (calamus) (van Wyk and Gericke 2000).

Miriana (Setswana), Muthi (Zulu) or Medicine (English) covers a wide range of traditional medicinal extracts and substances, including various charms and protective medicines. Apart from the general uses of traditional plant medicines for healing, current

in finding employment, luck in court cases and luck in siacs to keep loved ones (Sofowara 1982); keeping away evil spirits and returning them to their source; protection of family and self and strengthening of homes (Segar 1997, Cocks and Moller 2002). Of significance is their use as anti-cancer, immune stimulating, anti-infective, anti-malarial, cardiovascular and respiratory stimulating remedies (Grierson and Afolayn 1999, Kelmanson et al. 2000, Fennell and Van Staden 2001, Louw et al. 2002).

In the absence of sufficient and efficient health care systems, traditional medicines continue to play a vital role among rural communities of most developing countries (Taylor et al. 1995, Grierson and Afolayan 1999, Shale et al. 1999, Elvin-Lewis 2001, Cocks and Moller 2002, Louw et al. 2002, Shrestha and Dhillion 2003, Steenkamp 2003, Steenkamp 2003, Verschaeve et al. 2004). The use of traditional medicinal plants is escalating as many individuals, even those from western backgrounds, continue to turn to alternative medicines for cures not offered by western medicine and due to dissatisfaction with conventional medicine, often perceived to be too impersonal, costly and technical.

1.6.2 Sustainability

The informal trade of medicinal plants within southern Africa is comprised of approximately 400 000 - 500 000 traditional healers, selling crude traditional medicinal plants (Mander and Brenton 2006). More than 1 000 species of medicinal plants are traded and approximately 35 000 - 70 000 tons of plant material traded per year, amounting to an estimate of R400 million (Mander and Brenton 2006). In Durban alone, medicinal plant trade was valued at R100 million per annum (1996) and 1 500 tons of plant material traded (Mander and Brenton 2006). The annual trade of traditional remedies in Faraday (a traditional market located in Johannesburg) is estimated at 450 - 800 tons, valued at approximately R4.4 million. KwaZulu-Natal (a province in South Africa) and Johannesburg (a city located in the Gauteng province of South Africa), like most urban areas in developing countries have become the capitals of the medicinal plants trade in the county.

creased over the past decade, with industry growth of 9% from 2000 to 2001 (Stewart and Cole 2005). However, information on the quantity of traditional medicinal plants harvested for export and local trade is limited and even less information is available on the impact of such trade on harvesting. Nonetheless, it is evident that such material is harvested in large quantities from the wild (Cunningham 1998) and is destructive to natural plant communities (Cunningham and Mbenkum 1993). Many more studies investigating the over-exploitation of natural resources need to be conducted to understand the implications of harvesting on wild stocks as well as issues posing challenges to the sustainability of such plants (Cunningham 1994).

Over-exploitation of traditional medicines is primarily due to three main factors:

(1) A decline in the areas of distribution (Cunningham 1998), because of increased development and industrialisation.

(2) The significant increase in the population numbers and high rates of urbanisation. Africa has the highest rate of urbanization, with populations doubling every 14 years and cities growing at rates of 5.1% per annum (Huntley et al. 1989, Zschocke et al. 2000).

(3) The change in medicinal plant use from the specialist activity of traditional medicinal practitioners, to a commercial trade involving many informal street traders. The high unemployment rates coupled with low educational levels result in the increased supply of traditional medicinal plants, in catering to the high demands presented in urban areas (Cunningham 1998). High unemployment rates result in more vendors turning to this line of trade.

Most vulnerable to over-harvesting are popular, slow-reproducing species that are limited to specific habitats (Cunningham 1998). Slow-growing bulbous and tuberous plants are also highly threatened. This is mainly attributed to over-harvesting and destructive harvesting mechanisms employed (often whole plants are uprooted) (Cunningham 1991).

k, roots and whole plants is possible, the high level of ired for the management of these slow growing plants is difficult to sustain in South Africa (Cunningham 1998). However, cultivation of popular slow-growing plants is essential outside core conservation areas (Cunningham 1998).

Cultivation

Cultivation is a mechanism of removing harvesting pressure from wild stocks, especially in the case of plants harvested in large quantities. In order for traditional medicinal supply to be aligned with demand and to prevent the over-exploitation of natural resources, cultivation may have to be implemented in certain regions, although this comes with its own set of challenges.

The first limitation is linked to slow-growing species that are not financially viable in the short term and only yield slow returns (Mander et al. 2006). Low market prices set by local markets are another limiting factor (Mander et al. 2006). In addition, cultivators would still have to compete with individuals collecting material freely from the wild, incurring no input and running costs (Mander et al. 2006). There is also the preference for wild collection material to cultivated material, linked with the widespread belief that wild harvested material is more efficient. An example, is that of the American Ginseng (*Panax quinquefolius*); Asian buyers are willing to pay an extra 30% for wild-harvested roots as opposed to cultivated sources (Hamilton 2004). Contrastingly, studies conducted in the Eastern Cape of South Africa indicated that traditional healers were willing to use cultivated sources as they recognised the need for such a measure (Dold and Cocks 2001). Other constraints include the lack of information and knowledge of methods as well as a lack of finances.

duced, the chances are that it would be limited to the ue to additional expenses presented by the technique) eliminating the poor communities and locals reliant on the natural resource base (Hamilton 2004).

Various researchers argue that the sustainable use of many plant species may not be possible given the modern-day context of commercial exploitation, technological advancement, increased rural poverty and escalating population growth, and as a result, the increased scarcity of natural resources (Godoy and Bawa 1993, Cunningham 1994, Attwell and Cotterill 2000). Without addressing other factors that also play a role in sustainability such as human population growth and conservational issues, sustainability can never be achieved (Struhsaker 1998, Attwell and Cotterill 2000). The cultivation of medicinal plants could help alleviate pressures on wild stocks; however, without the correct implementation of conservational programs and measures, these wild stocks will continue to diminish from the wild.

Conservation

The importance of medicinal plants in conservation is associated with the role medicinal plants play in many cultures and livelihoods. Various recommendations have been compiled relating to traditional medicinal plant use. Included in the recommendations are issues such as the inclusion of communities in policy making; the need for more information on medicinal plant trade; the establishment of systems for monitoring medicinal plants; the development of sustainable harvesting practices; the protection of traditional resources and intellectual property rights; as well as the establishment of small businesses for rural communities (Hamilton 2004).

For conservation to be successful, conservation teams need to comprise different types of specialists, including indigenous groups that have over the years managed and ensured the sustainability of natural plant resources (Cunningham 2001). The implementation of regulations and acts aimed at conserving natural resources, but excluding local

the long term. This is mainly because many such rvesting the natural resources, even if illegally. Communities need to be incorporated in management programs, so they too can be aware of crucial issues such as sustainable harvesting. Failure to allow communities access to natural resources reduces their incentives in conserving it and undermines local livelihoods (Pimpet and Pretty 1997).

Plant part substitution

In a number of instances, when a preferred species becomes scarce, similar products are used (Sunderland and Ndaye 2004). A study by Zschocke and van Staden (2000) on pharmaceutical comparison between *Ocotea bullata* species and *Cryptocarya* species revealed *Cryptocarya* species were justified for use as substitute plants for *O. bullata* with respect to inhibitory activity to selected extracts (COX-1 and COX 2 inhibition). Due to the scarcity of *O. bullata* in KwaZulu-Natal, herbalists often tend to use the alternative bark of *Cryptocarya* species. To prevent the extinction of *O. bullata* through over-exploitation, it is important that alternative sources of medicinal plants be investigated.

The same study also investigated plant part substitution and the use of leaves instead of bark material. Results indicated extracts of fresh *O. bullata* leaves were significantly more active than *O .bullata* bark extracts. The activity of dry leaves and bark was equal (Zschocke and van Staden 2000). This shows that, although bark and root material have high concentrations of active ingredients, other plant parts could be just as effective. However, more studies will have to be conducted as these properties vary within species. The utilization of leaves instead of bark would help in the management of threatened species to prevent the unsustainable use of bark material.

A variety of legislation governs the trade and use of traditional medicinal plants, both at international and local level. At an international level is the Convention on Biological Diversity (CBD) that requires signatory countries to minimise impacts on biological diversity and upgrade previously degraded areas, to ensure the sustainability of natural resources. The Convention of International Trade in endangered species of wild fauna and flora (CITES) is also applicable internationally. The agreement regulates the trade of threatened and endangered species and is divided into three appendices according to the level of protection or endangerment of the species and offers various permits depending on the selected category. Appendix I comprises species faced with extinction. Appendix II, primarily offers a warning signal for species not yet threatened but in need of management to avoid over-exploitation., Appendix III deals with species protected at local levels (within countries).

At a local level, all provinces within South Africa have legislation dealing with the use of natural plant resources, e.g. the KwaZulu-Natal nature conservation Act (Act No. 9 of 1997) that protects plant species such as *Encephalartos cerinus*, *Ocotea bullata* and *Warburgia salutaris*. National regulations and acts include the National Forest Act (No 84 of 1998), the National Environment Management Act (Act No. 107 of 1998) and the Biodiversity Act (Act No 10 of 2004). The Biodiversity Act is aimed at managing and conserving biodiversity within the framework of the National Environmental Management Act. Although such policies are now in place and legal frameworks established, the lack of full implementation expressed by the policies, laws and strategies by the associated institutions in the major limiting factor in controlling and managing biodiversity.

There are also traditional medicine programs in place to promote South Africaôs medicinal plant conservation and awareness as well as cultural and health awareness. An example of such a program is TRAMED (Traditional Medicinal Projects) started in 1994

collaboration with various institutions (Hoareau and

Specially protected species are those species that are under most threat of extinction and require the most protection, especially legally (Diederichs 2005). In the case of such species, special permits are required to allow for harvesting, export or any form of relocating the species (Diederichs 2005). Examples of specially protected species in KwaZulu-Natal include *Encephalartos cerinus*, *Ocotea bullata* and *Warburgia salutaris*. Protected species are those not currently threatened but require legal protection to prevent over-exploitation (Diederichs 2005). Examples in KwaZulu-Natal include various aloe and *Protea* species and *Siphonochilus aethiopicus* (wild ginger).

Examples of over-exploitation in the country

South African examples of plants that have been impacted by over-harvesting and over-exploitation include the African cherry (*Prunus africana*) and devilôs claw (*Harpagophytum spp*). *Prunus africana* is a widespread tree in montane habitats of Africa (Stewart 2003). Historically, *P. africana* was used for a variety of purposes, including its value as a source of timber and use as building material; a source of fuel and a source of food for birds and mammals endemic to forests of Cameroon (some of which were listed in the Red data book)(Stewart 2003). However, the species is also primarily used for medicinal purposes in the treatment of malaria, stomach aches, fevers, urinary problems, sexually-transmitted diseases etc. (Cunningham and Mbenkum 1993). Following the discovery of the barkôs efficiency in treating prostate gland hypertrophy, the species populations have been declining in many forests due to over-harvesting and improper harvesting techniques (Cunningham and Mbenkum 1993). The species now appears in Appendix II of CITES, and is listed as vulnerable. Of particular interest is the association of the natural resource to the Kwifon society (Steward 2003), an indigenous local community in Cameroon. The indigenous group over the years had managed resources within the forests ensuring sustainability. However, with the introduction of

any customs governing management principals were ted in the collapse in the conservation of the species.

Devilôs claw is the common name for two species in the genus *Harpagophytum*. The root extracts of the Kalahari plants (Sunderland and Ndaye 2004, chapter 4) contains the chemicals iridoid glycoside and harpagoside, both of which are effective in treating rheumatoid arthritis, osteoarthritis, tendonitis, kidney inflammation as well as heart related diseases (Steward and Cole 2005). A high percentage of the worldôs supply of the material is collected from the wild from Namibia, South Africa and Botswana, with Namibia being the greatest supplier. A total of approximately 600 - 700 tons of material is traded on an annual basis amounting to an estimated U.S.$ 100 million internationally (Sunderland and Ndaye 2004, chapter 4). In 2002 (the peak year of export), as much as 1 000 tons of material was exported from Namibia alone estimating to approximately U.S.$ 2.7 million. Ten thousand and eighteen tons of dry tubers were exported from South Africa within the same year (Steward and Cole 2005). The massive increase in trade was coupled with the intense unsustainable harvesting of the material form the wild.

The species were later recommended for listing under Appendix II of CITES, however this was declined as many countries were implementing collective efforts in ensuring sustainable development (Steward and Cole 2005). The main limiting factor is the low prices paid to harvesters, who are forced to collect as much material as possible to get a reasonable salary.

Other species threatened by harvesting and over-exploitation include *Aloe* species and *Warburgia salutaris* (pepper bark). Pepper bark is a well-known South African plant traded and used for over 20 different medical purposes, including bronchitis, ulcers, chest infections, thrush and many others (Botha et al. 2004). *Warburgia salutaris,* a red data species, can now only be found in protected areas around South Africa. While many species of Aloe are traded, one example of a threatened Aloe is that of *Aloe peglerae* (Asphodelaceae). It is limited to the Magalisburg mountain range in the Gauteng and North West provinces of South Africa and is listed as endangered, mainly threatened by

2004). Studies conducted by Pfab and Scholes (2004) hly sensitive to harvesting of adult plants, with use sustainable at levels not more that 0.12%. The harvesting of one plant is only sustainable in as large a population as 1 000 species, which rarely exist (Pfab and Scholes 2004). This indicated that the current collection of the species from the wild is unsustainable.

Due to lack of biological data (Fitzgerald 1994, Shankar et al. 1996) scientific studies for setting sustainable quotas are scarce and limited (Godoy and Bawa 1993, Struhsaker 1998). More studies have to be undertaken in the future to assess the impacts of harvesting on plant natural resources, the cultivation of threatened species as well as optimal harvesting systems that will consider the availability of resources, the rate of use and the regeneration potential of the species (Mc Gregor 1994, Hartshorn 1995). An understanding of the resource base is important for developing a sound management system for harvesting resources (Seydack 1991).

1.6.2. Culture and relocation

Indigenous knowledge owes its existence to culture, defined as a combination of beliefs, attitudes, values and symbols shared by a group of individuals, usually due to living within close proximities. These factors govern individual behaviours, and outlook on life (Baumann 1998). The continuation of traditional knowledge is embedded in the concepts of culture and tradition, and of particular interest is the passing on of such customs to the younger generations. Various studies have shown that such transmission of knowledge from the elderly in communities to the young is specialized around age (Raum 1940). The young in the community learn from the elderly through participatory observations and daily practices.

Culture is under continual change, constantly growing and adapting to various internal and external factors that have an influence on indigenous groups and communities (Bjerregaard et al. 2002). South Africa has a complex combination of cultures that have a direct influence on each other and are often inter-related. Migration and urbanization are

anges as they bring about the contact and exposure of ltures. Individuals facing cultural adjustments usually respond by either, grouping together and recreating a familiar environment, or by acculturating, adapting and taking up new cultures (Baumann 1998). The process of acculturation usually results in the death and loss of specific cultures as they expand, diverge and become inclusive of other norms and practices. Socio-cultural changes have until now been studied by a number of researchers who have attributed such changes to acculturation, urbanization, migration, modernization and westernization (Berry and Kim 1998, Bjerregaard et al. 2002).

1.6.4 Setswana culture and tradition

For the purposes of this study, focus is only on the Setswana culture and tradition in relation to traditional plant use for medicinal purposes. The official religion of most Setswana tribes is Christianity. Most tribes believe in a super being, God, *Modimo*, a creator associated with phenomena such as rainmaking, good weather conditions as well as bad ones (associated with punishment) (Schapera and Comaroff 1953, Sofowa 1982). Another dominant belief is the worship of the dead or ancestral worship. Most Setswana tribes believe in life after death, in some form of survival after death where the dead continue to lead a life similar to one on earth but continue to take an active interest in the health and fortunes of their descendents. In this life, ancestors are able to exert some form of power on their descendents, rewarding those who are respectful and obedient with good health, prosperity and fortune but punishing those who are disobedient or prevail against the social code with sickness, economic loss and misfortunes (Schapera and Comaroff 1953, Sofowa 1982). Each family has its own family of ancestors made up of all family members that lived before them. Meat and beer are occasionally offered to both ancestors and God during huge feasts called *Mekete*, as a sign of thanksgiving and prayer for guidance and prosperity.

Traditional healers (sangomas, witchdoctors, diviners), as well as some members of the community practicing self-medication, pray to ancestral spirits while preparing traditional

erful in fulfilling its purpose. Sometimes a personôs l to the anger of ancestors, in this case, a traditional healer has to intervene by giving the patient certain medicines that remove evil vibrations and restore luck and peace with ancestors, usually an offering has to be made (Schapera and Comaroff 1953).

Traditional healing or ómagicalô healing is the use of traditional medicines for the achievement of certain purposes that cannot be achieved by western methods alone (Schapera and Comaroff 1953). These include various kinds of medicines from a diverse array of cultures and areas and there are medicines for treating diseases, protection, enhancing fertility, luck, success in courtship and all areas of life as well as ones for injuring enemies (Schapera and Comaroff 1953).

Although the focus of this study is self-medication, there are other forms of traditional healing; these include consulting *dingaka* in Setswana, or *sangomas,* in Zulu (traditional healers). Herbalists mainly sell traditional plants without administering to the patient, as most customers know exactly what they want when they purchase herbs or usually ask for advice with a good knowledge of the disease or misfortune at hand.

Individuals consult *sangomas* when unsure of the course of sickness or misfortune. This profession is a special calling and is often attributed to certain families, as it is past down from generation to generation within a family. Others that want to become *sangomas* have to go to a special school, where a professional healer teaches them the different kinds of traditional medicines and how to administer to different situations. *Sangomas* are often faced with patients that are victims of sorcery. Sorcery occurs when herbs are used maliciously to harm people and their surroundings (Schapera and Comaroff 1953). Individuals practice sorcery intentionally because of greed, envy and vengeance and collect or purchase medicine from healers or herbalists (Schapera and Comaroff 1953).

Herbal medications such as *phinda* (return) are used for returning evil vibrations and bad intentions back to the sorcerer. Various herbal plants are used in protection against

d extracts are used for protecting the body and to even use prophylactic medicines before eating away from home as the medicine makes them vomit if they swallow food poison (Schapera and Comaroff 1953, Cocks and Moller 2002).

1.7 The future of traditional medicine in South Africa

Given the current explosive increase in population numbers, increasing social inequality, globalization, as well as the reduced government investments in health care services, the increased use of alternative cheaper medicine is inevitable (Janes 1999). As an alternative form of medication, traditional medicinal plants cater to the poorer individuals with insufficient funds for western consultation. Of most importance, the value of traditional medicines is not only in providing healing, but also in offering cures that present centrally important cultural beliefs and principles (Schapera and Comaroff 1959, Sofowa 1982, Janes 1999), presenting patients with belief systems vital in attempting to cope with a disease. Contrary to western medicines, South African traditional medicines are linked to *modimo* (God) and the ancestors, both of which determine a personôs well being. During the preparation of traditional medicine, one has to talk to the medicine as well as pray to the supreme rulers.

Of major concern and especially of vital importance is the role of traditional plants in controlling chronic and terminal diseases. HIV/AIDS and other chronic diseases require patients to undergo some form of counselling. However, traditional healing practices usually do not account for such treatment, although the alternative form of healing does take a holistic therapeutic approach of the body and mind, and certain concoctions are used to keep a person in the right state of mind. Some form of legitimacy however, is required for traditional healing to prosper and compete with western medication. A system needs to be implemented to monitor the sale and use of traditional plants so that individuals may be held liable for the improper use of such medication. Legitimacy of such practices would aid in reducing the high occurrences of poisoning, attributed to traditional remedies (Elvin-Lewis 2001). Cases of poisoning with *muthi* (traditional

n Africa (Steward et al. 1999). Of the 206 fatal cases), 155 were stated to be a result of *muthi* poisoning.

Although standards need to be set for the use of traditional medicines in South Africa, too much standardisation of traditional medicines along scientific lines could in future result in the narrowing of such treatments, and the gradual absorption of traditional medicine into western medicine (Janes 1999).

There have been various attempts in South Africa to bring some form of legitimacy to the field of traditional medicine. One such program was conducted on traditional healers, through the HIV/AIDS prevention program, AIDS communication project and the AIDS control and prevention project. Thirty healers were trained and in turn had to train 30 other healers and henceforth. The idea was to increase awareness and treatment of HIV in traditional healers (Green et al. 1995). Traditional healers in South Africa also have to affiliate to a certain national healer organization. However, this issue is currently faced with various barriers and only 20% of all traditional healers in the Johannesburg region are affiliated to an organization (Green et al. 1995).

The incorporation of traditional medicine into western medicine is becoming more evident in South Africa as most pharmaceutical companies have undertaken the role of selling and packaging various traditional plants. *Muthi* shops for instance, sell medicinal plants with better packaging and at a higher price compared to most informal herbalists that sell in the streets (Mander 1998). South Africa, like most Asian countries, could be moving towards a situation where the legitimacy of traditional medicine comes at the cost in the loss of such traditional practices and a loss to the cultural meaning behind it. Alternatively, the deeper meaning of culture and the original spiritual use of traditional medicines will continue to play a role in the survival of this alternative source of medicine in a country so engulfed by dynamism.

Extensive literature is available on the use of traditional medicinal plants in general, with particular emphasis on Nguni culture, especially within the Zulu-speaking people. However, very little research has been conducted on indigenous knowledge within the Sotho culture and specifically within the Setswana group. This study is a first attempt to focus on the Setswana people and their use of traditional medicines. Although topics on sustainable harvesting and sustainable development have been investigated, insufficient information is documented in relation to the group.

Attwell C. and Cotterill F. 2000. Post modernism and African conservation science. *Biodiversity and Conservation* 9: 559-577.

Barrie A., Rebelo A and Bredenkamp G. 1996. Vegetation of South Africa, Lesotho and Swaziland: a companion to the vegetation map of South Africa, Lesotho and Swaziland. Dept of Environmental Affairs & Tourism, Pretoria, South Africa.

Baumann S. 1998. Psychiatry and primary health care: A practical guide for health care workers in South Africa. Juta and Co, Ltd. Kenwyn, South Africa.

Berry J.W. and Kim U. 1988. Acculturation and mental health. *Cross cultural research and methodology series* 10: 07-236.

Bjereegaard P., Curtis T. and the Greenland population study. 2002. Cultural change and mental health in Greenland: the association of childhood conditions, language, and urbanization with mental health and suicidal thoughts among the Inuit of Greenland. *Social Science and Medicine* 54: 99-48.

Cockerton M. 1996. Less barrier, more a line: the migration of Bechuanaland woman to South Africa, 1850 to 1930. *Journal of Historical Geography* 22: 291-307.

Cocks M. and Dold. A. 2000. The role of African chemists in the health care system of the Eastern Cape province of South Africa. *Social Science and Medicine* 51: 1505-1515.

Cocks M. and Moller V. 2002. Use of indigenous and indigenised medicines to enhance personal wellbeing: a South African case study. *Social Science and Medicine* 54: 387-397.

better life: perspective medicinal plant use in the re of languages in education for San and Khoe South Africans. *International Journal of Educational Development* 19 (4-5): 323-335.

Cunningham A.B. 1990. People and Medicines: the exploitation and conservation of traditional Zulu medicinal plant. *Mitteilungen aus dem institute fur allgemeine Botanik. Hamburg* 23: 979-990.

Cunningham A.B. 1991. Development of a conservation policy on commercially exploited medicinal plants: A case study from Southern Africa. In: Akerele O. Heywood V and Synge H. (eds.) Conservation of medicinal plants. Cambridge University Press, Cambridge, UK: 337-358.

Cunningham A.B. 1998. People and Plants Initiative, Bettyôs Bay, South Africa. WWF/UNESCO/Kew

Cunningham A.B. and Mbenkum F. 1993. Sustainability of harvesting *Prunus africana* bark in Cameroon: a medicinal plant in international trade. People and plants working paper 2, pp 1-28 WWF/UNESCO/KEW Paris, France.

Cunningham A. 1994. Integrating local plant resources and habitat management. *Journal of Biodiversity and Conservation* 3:104-115.

De Wet A. 1993. Plants of southern Africa: names and distribution. *Memoirs of the Botanical Survey of South Africa* 62. National Botanical Institute. Pretoria.

Diederichs N. 2006. Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

mberg R. 2006. Conservation and trade regulations in . (eds.) Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Elvin-Lewis M. 2001. Should we be concerned about herbal remedies? *Journal of Ethnopharmacology* 75: 141-164.

Fabricant T. and Earnsworth N. 2001. The value of plants used in traditional medicine for drug discovery. *Environment Health Perspective* 109: 69-75

Fennell C. and van Staden J. 2001. *Crinum* species in traditional and modern medicine. *Ethnopharmacology* 78:19-26.

Fitzgerald L. 1994. *Tupinambis* lizards and people: a sustainable use approach to conservation and development. *Conservation Biology* 8(1):12-16.

Godoy R. and Bawa K. 1993. The economic value and sustainable harvest of plants and animals from the tropical forests: assumptions, hypotheses and methods. *Economic Botany* 47: 215-219.

Green E., Zokwe B. and Pupree J. 1995. The experience of an AIDS prevention program focused on South Africa traditional healers. *Social Science and Medicine* 44(4):503-515.

Grierson D. and Afolayan A. 1999. Antibacterial activity of some indigenous plants used for the treatment of wounds in the Eastern Cape. *Journal of Ethnopharmacology* 66: 103-106.

Hamilton A. 2004. Medicinal plants, conservation and livelihoods. *Biodiversity and Conservation* 13: 1477-1517.

s for sustainable development in tropical forests. *ematics* 26: 5-175.

Hoareau L. and Da Silva E. 1999. Medicinal plants: a re-emerging health aid. *Electronic Journal of Biotechnogy* 2:56-70.

Hutchings A. 1996. Zulu medicinal plants: An inventory. University of Natal Press, Pietermaritzburg.

Huntley B., Siegfried R. and Sunter C. 1989. South African environments into the 21st century. Human and Rousseau. South Africa, Cape Town.

Iwu M. 1993. Handbook of African medicinal plants. CRC Press Inc. Washington DC.

Jäger A., Hutchings A. and van Staden J. 1996. Screening of Zulu medicinal plants for prostaglandin-synthesis inhibitors *Journal of Ethnopharmacology* 52: 95-100.

Janes C. 1999. The health global modernity and the crisis of traditional medicine: The Tibetan case. *Social Science and Medicine* 49: 1803-1820.

Kelmanson J., Jäger A. and Staden J. 2000. Zulu medicinal plants with antibacterial activity. *Journal of Ethnopharmacology* 69:241-246.

Kraaij T and Ward D. 2003. Effects of rain, nitrogen, fire and grazing on tree recruitment and early survival in bush-encroached savanna. *Plant Ecology* 73: 235-253.

Laws G., Davies I., Corbett G., Jerrett T. and Jerrett D. 1995. Colour terms in Setswana: The effects of age and urbanization. *Journal of Language Sciences* 17: 49-64.

L. 2002. Medicinal plants of South Africa and their of infectious diseases. *Journal of Ethnopharmacology* 82: 147-154.

Mander M. 1997. Medicinal plant marketing and strategies for sustaining the plant supply in the Bushbuckridge area and Mpumalanga province. Danish Corporation for Environment and Development (DANCED). South Africa.

Mander M. 1998. The marketing of indigenous medicinal plants in South Africa: A case study in KwaZulu-Natal. Food and Agriculture Organisation of the United Nations, Rome. 151pp.

Mander M. and Brenton G. 2006. Overview of the medicinal plants industry in South Africa. In Diederichs N. (ed.) Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Mander M. Steytler N. and Diederichs N. 2006. The economics of medicinal plant cultivation. In Diederichs N. (ed.) Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

McGregor J. 1994. Woodland pattern and structure in a peasant farming area of Zimbabwe: ecological determinants, present and past use. *Journal for Ecological Management* 63: 97-133.

Meyer J. and Afolayan A. 1995. Antibacterial activity of *Helichrysum aureonitens* (Asteraceae). *Journal of Ethnopharmacology* 47: 109-111.

Obiri J., Lawes M. and Mukolwe M. 2002. The dynamics and sustainable use of high-value tree species of the coastal Pondoland forests of the Eastern Cape Province South Africa. *Forest Ecology and Management* 166:131-148.

Rowley-Conwy P. 2001. Hunter-Gatherers: An onous and medicinal plants. Cambridge University, Cambridge, UK.

Pfab M. and Scholes M. 2004. Is the collection of *Aloe peglerae* from the wild sustainable? An evaluation using stochastic population modelling. *Biological Conservation* 118: 695-101.

Pimbert M. and Pretty J. 1997. Diversity and sustainability in community based conservation. Paper presented to the UNESCO-IIPA regional workshop on community-based conservation. February 9-12. India.

Raja D., Blanchã C. and Xirau J. 1997. Contribution to the knowledge of the pharmaceutical ethnobotany of La Segarra region (Catalonia, Iberian Peninsula). *Journal of Ethnopharmacology* 57: 81-87.

Raum O.F. 1940. Chaga childhood, a description of indigenous education in an East African Tribe. London, Oxford University press.

Schapera I. and Comaroff J. 1953. The Tswana, 2nd.ed Kegan Paul International Ltd. London, England.

Segar J. 1997. Hard lives and evil winds: Illness aetiology and the search for healing among Ciskeian villages. *Journal of Social Science* 44: 1585-1600.

Shale T., Stirk W. and Van Staden J. 1999. Screening of medicinal plants used in Lesotho for antibacterial and anti-inflammatory activity. *Journal of Ethnopharmacology*. 67: 347-354.

Seydack A. 1991. Inventory of South African national forests for management purposes *South African Journal of Botany* 59: 569-574.

, Ganeshaiah K. and Bawa K. 1996. Extraction of Biligiri Rangan Hills, India. Productivity, extraction and prospects of sustainable harvesting of Almla *Phyllanthus emblica* (Euphorbiaceae). *Economic Botany* 50 (3): 270-270.

Sheldon J.W, Balick M.J and Laired S.A. 1997. Medicinal plants: can utilization and conservation coexist? The New York Botanical Garden, NewYork. *Advances in Economic Botany* 12: 310-327.

Shelton H.D. and Katrinka E.1993. Traditional Knowledge and sustainable development, Proceedings of a conference. The World Bank, Washington DC, September 27-28.

Shrestha P. and Dhillion S. 2003. Medicinal plant diversity in the highlands of Dolakha district, Nepal. *Journal of Ethnopharmacology* 86: 81-96.

Skarpe C. 1992. Dynamics of savanna ecosystems. *Journal of Vegetation Science* 3:293-300.

Smith A., Malherbe C., Guenther M. and Berens P. 2000. The Bushman of South Africa. Cape and OHIO University Press. Ohio.

Springfield E., Eagles P. and Scott G. 2005. Quality assessment of South African herbal medicines by means of HPLC fingerprinting. *Journal of Ethnopharmacology* 101: 75-83.

Sofowara A. 1982. Medicinal plants and traditional medicine in Africa. University of Ife, Nigeria.

Stats Online, Population statistics: Census data 2001. [Online] 15 April 2004. www.statssa.gov.za/census01

erbal remedies used by the South Africa women for *of Ethnobotany* 86: 97-108.

Stewart K. 2003. The African cherry (*Prunus africana*): From hoe-handles to the international herb market. *Economic Botany* 57: 559-569.

Stewart K and Cole D. 2005. The commercial harvest of devils claw (*Harpagophytum spp*) in southern Africa: The devilôs in the details. *Journal of Ethnopharmacology* 100: 225-236.

Steward M. Moar J. Steenkamp P. and Kokot M. 1999. Findings in fatal cases of poisoning attributed to traditional remedies in South Africa. *Forensic Science International* 101: 177-183.

Struhsaker T. 1998. A biologistôs perspective on the role of sustainable harvest in conservation. *Conservation Biology* 12: 930-932.

Sunderland T. and Ndaye O. 2004. Forest products, livelihoods and conservation: Case studies of non-timber forests product systems. Vol 2-Africa. Centre of international forest research, Indonesia.

Sunderland A. and Mbenkum F. 1993. Sustainability of harvesting *Prunus africana* bark in Cameroon: A medicinal plant in international trade. People and Plants working paper 2. UNESCO Press. Paris.

Taylor R., Manandhar N. and Towers G. 1995. Screening of selected medicinal plants of Nepal for antimicrobial activities. *Journal of Ethnopharmacology* 46:153-159.

Thring T. and Weitz F. 2005. Medicinal plant use in the Bredasdorp/Elim region of the Southern Overberg in the Western Cape Province of South Africa. *Journal of Ethnopharmacology* 103: 261-275.

Cape traditional plant use projects: proceedings of a workshop: Traditional medicines and plant management. Cape town, Kirstenbosch 13 March 1990.

van Wyk B., Oudtshoorn B. and Gericke N. 1997. Medicinal plants of South Africa. Briza, Pretoria.

van Wyk B. and Gericke N. 2000. Peopleôs plants. Briza publications. Pretoria, South Africa.

Vayda P. 1969. Environmental cultural behaviour. The Natural History Press. New York.

Verschaeve L., Kestens V., Taylor J., Elgorashi E., Maes A., van Puyvelde L., De Kimpe N. and Staden J. 2004. Investigation of the anti-mutagenic effect of selected South African medicinal plant extracts. *Toxicology in Vitro 18*: 29-35

Watt J. and Breyer-Brandwijk M. 1962. The medicinal and poisonous plants of South Africa, 2nd ed. Livingstone, Edinburgh: 609-690.

Williams V., Balkwill K. and Witkowski E. 2000. Unravelling the commercial market for medicinal plants and plant parts on the Witwatersrand, South Africa. *Biodiversity and Conservation* 14: 2971-3001.

Yield J. 2002. South Africaôs Medicinal plants. Cape Argus.

Zschocke S., Rabe T., Taylor J., Jäger A. and van Staden J. 2000. Plant part substitution - A way to conserve endangered medicinal plants? *Journal of Ethnobotany* 71: 281-292.

APTER TWO

USE OF TRADITIONAL MEDICINES BY THE SETSWANA-SPEAKING COMMUNITY, KIMBERLEY, NORTHERN CAPE

2.1 Abstract

This chapter focuses on self-medication and the use of traditional medicinal plants as a form of primary health care by the Setswana-speaking community in Kimberley, Northern Cape of South Africa. A questionnaire, participatory observation, and botanical species identification were used to document plant species used in the area. Profiles of resource users, methods of administration and the implications of relocation on indigenous knowledge and plant use were also documented. A diverse array of plant material was traded, most of which was collected from other parts of the country. Wild harvesting in the area was mostly in the form of underground parts such as roots, rhizomes, bulbs, and tubers. Although most species sold were not harvested locally, of particular interest was the over-harvesting of the African potato (*Hypoxis hemerocallidea*), indicated by increased travelling distances to the natural resource. The usage and knowledge of traditional medicinal plants in the area, has expanded from local to national use of diverse plant material. Relocation plays a role in the utilization and knowledge of traditional medicines, as it results in the amalgamation of various cultures, thus offering alternatives to traditional plants used locally. A more detailed investigation on the sustainability of harvesting in the area is reported in chapter 3. This was in order to determine if over-exploitation is a threat to species diversity in the area.

It is estimated that between 60 and 80% of the worldôs population uses traditional medicinal plants as a form of primary health care (Singh et al. 1979, Mander and Breton 2006). In addition, 25% of all prescribed medicines contain ingredients derived from plants (Mander and Breton 2006). The use of traditional remedies is becoming increasingly popular globally (Elvin-Lewis 2001), partly due to the recognition of the value of medicinal plant sources as primary material for the pharmaceutical industry (Desmet 1997, Winslow and Kroll 1998).

The market for traditional medicines is estimated to be growing at an annual rate of 20% (Subrat 2002), with the quantity of plants traded from one province in China having escalated 10 fold in a space of 10 years (Pei 2002). Factors affecting growth in demand include the increasing human population coupled with the inefficiency of western medicine in developing countries (Hamilton 2004). Apart from the dependency of individuals from rural areas, exposed to insufficient and inefficient health care systems, herbal medicines have become more fashionable in richer countries (Hamilton 2004). In 2001, U.S.$ 17.8 billion were spent on dietary supplements; of this, U.S.$ 4.2 billion were spent on herbs and other botanical remedies (Donald and Arthur 2002).

The informal trade of medicinal plants within Southern Africa is comprised of between 400 000 - 500 000 traditional healers, selling crude traditional medicinal plants (Mander and Breton 2006). More than 1 000 species of plants and between 35 000 and 70 000 tons of plant material is traded per year. This amounts to an estimated R400 million (Mander and Breton 2006). In Durban alone, medicinal plant trade is valued at R100 million per annum and a total of 1 500 tons of plant material is traded (Mander et al. 2006).

Traditional medicinal plants have a diverse array of uses and serve as cures for various diseases. Examples include the Saint Johnôs wort (*Hypericum perforatum*), which has been used for centuries in treating individuals with moderate depression. Local examples of medicinal plant use include the African potato (*Hypoxis hemerocallidea*) administered

laches, dizziness, and cancers (Crouch et al. 2006). *Hypoxis hemerocallidea* was found to be administered as a blood-purifying agent. The pepper bark (*Warburgia salutaris*) an endangered species, due to over-exploitation, is another example, used for treating fevers, malaria and influenza virus (Crouch et al. 2006).

Types of traditional remedies include, crude plant-based medicines (not processed but sold in the raw form); herbal remedies (processed plant based medicines mainly traded in informal markets); plant-derived allopathic medicines (plant based medicines that have been legally recognised) and other plant based healing products (for cosmetic and dietary purposes) (Mander and Breton 2006). For the purposes of this study, a traditional medicinal plant refers to crude plant-based traditional medicines as well as herbal remedies. The study only focuses on crude traditional medicines and herbs dispensed by the street vendor.

Generally medicinal plants are traded in two types of market systems, the informal and formal market systems. The informal market system is characterised by traditional healers, herbalists and traders selling plants informally off the streets and market places. There are no regulations or very limited regulations governing such sectors and as a result, plant quality and quantities tend to be variable. In informal systems, little attention is paid to plant packaging as well as proper marketing strategies. The formal market system is characterised by high-income consumers with specific needs and requirements, unlike the informal markets that mainly cater to low-income individuals. Of the plant material traded, 95% is out of informal markets and only 5% in formal markets (Mander and Breton 2006). This study primarily focuses on the informal market sector of traditional medicinal plant trade.

The intense use of traditional plants and the harvesting of wild stocks are highly dependent on the countryôs extreme diversity. South Africa is a hotspot for biodiversity with more than 22 000 plant species occurring within its boundaries, representing 10% of the worldôs species, although only taking up 1% of the earthôs surface (Coetzee et al.

area) makes up 33% of South Africa and is unique in cultures also exists in these areas, especially in Kimberley. Of interest is the link between biodiversity and culture in relation to this biodiversity.

Of particular interest is the change in Setswana culture from historical times to the modern day. Historical occurrences and phenomena in South Africa, like many other countries, have resulted in a spread and uniformity of traditional beliefs and cultures, as different cultures acculturated to form uni-cultures (Baumann 1998). Kimberley, a mining town of the diamond era, has had a highly dynamic population turnover with consequent inflow of many cultures, beliefs and norms. Apart from the massive influx of people to urban areas as a result of the gold and diamond rush, in the past under the old apartheid regime, millions of black South Africans were relocated to overcrowded and poor areas in the townships and homelands (RDP policy framework 1994). The national land reform program is a strategy that aims to address these past forced removals and rejection of access to land. This is done through land redistribution and restitution for those who lost land during the past governments (RDP policy framework 1994). This process has resulted in further mixing and adjusting of cultures to surrounding new ones.

To address some of the shortcomings of medicinal anthropology this study also investigates the impacts of relocation and resettlement on plant use; methods of collection and the sustainability of the natural resource; as well as the transmission of Setswana indigenous knowledge inter-generationally.

es of the chapter

The general aims and objectives of the study were to:

1. Gather data on herbal plant preparation, frequency of use and reasons for purchasing (as opposed to collecting from the wild).
2. Document a list showing a general identification of resources used and reasons for use (Appendix 2).
3. Gather information on the resource users (key groups) specifically interested in poor resource users, their personal profiles.
4. Present research on the inter-generational transfer of indigenous knowledge and use of traditional medicines. Here, the question asked is: is the root of knowledge upbringing and culture or do other factors play a role?
5. Investigate whether relocation has any implications on cultural changes, resulting in the acculturation of cultures to form uni-cultures in the long run.

2.4 Context of the study

Research was conducted in Kimberley, Northern Cape of South Africa. Kimberley has a population of approximately two million, 48% of which are female and 52% male (Stats SA, Census data 2001). For the purposes of this study, emphasis is placed on the African black communities, as they are the main purchasers and users of traditional herbal plants. Of the total population in Kimberley, 52% is African black, and 31% coloured, of which 68% speak Afrikaans and 21% Setswana. The Northern Cape has the highest unemployment rate at 20% of the total population in South Africa, coupled with the lowest level of education (Stats SA, Census data 2001). Eighteen percent of individuals older than the age of 20 have no schooling. Twenty-one percent have some primary school education, 30% some secondary school education and only 6% have any form of higher education (Stats SA, Census data 2001).

The study was conducted over a period of two weeks (October 2003) and used three data collection methods: questionnaires (Appendix 1), participatory observation, and botanical specimen identification. Participatory observation as well as species identification was done with the help of a Rastafarian herbalist selling herbs informally next to the Kimberley city centre. This particular herbalist showed a particular interest in the study and portrayed exceptional knowledge not just on medicinal plants but also on plant conservation practices and guidelines. *Muthi* (herbal) shops are perceived to be more expensive compared to the local street vendors and tend to eliminate the poorer members of the community. These shops were thus ruled out of this particular study, as the study mainly focuses on poorer communities in the area. There were only two street vendors selling traditional medicinal plants within the city; a Rastafarian herbalist and another herbalist situated on the outskirts of town. The other herbalistôs stall was less diverse and because of its positioning, eliminated the diverse masses attracted to the urbanized city centre.

A total of 89 questionnaires were conducted on customers, each questionnaire taking up approximately 15 minutes per individual. The first part of the questionnaire focused on obtaining information on consumer personal profiles. This included categories such as gender, age group, level of education, upbringing, marital status, religion, occupation, culture and language group.

Participatory evaluation was conducted on customer - seller interactions. Taking part in the sale of herbal plants as well as explaining plant uses and application to new and interested parties gave the researcher a feel of the type of questions community members ask about certain herbs as well as the conditions to be treated.

A list of medicinal plants used as well as related diseases and concerns was documented (Appendix 2). Although researchers have invested efforts to understand the use and properties of traditional medicine, very few studies have observed the root of indigenous

questionnaire focused on how communities practice
erations.

Information on medicinal plant preparation, plant parts used and methods of collection was acquired from the herbalist himself. Some buyers, who were also collectors, were queried on methods of collection. The rest of the customers, who were non-collectors, presented various reasons for not harvesting medicinal plants from the wild.

A species list was compiled not just based on traditional medicines purchased by customers but on all species sold at the stall. Pictures of all plant species traded were also taken (Appendix 3). Species names were derived from existing literature using native names (Hutchings 1996, Koenen 1996, van Wyk et al. 1997, van Wyk and Gericke 2000, Cunningham 2001, Arnold et al. 2002, van Wyk and Wink 2004, Diederichs 2006). Plant species that could not be identified using existing literature were taken to the University of Cape Town herbarium for identification.

2.6 Data analysis

Data were analysed using the SAS statistical program. A chi-squared (χ^2) test was used to test for significant differences between various classifications and categories as requested in the study.

2.7.1 Preparation and administration of traditional plant medicines

Individuals purchased plants they already had in mind and the large majority (n = 88) did not seek medical advice from the herbalist. Only a few first-time buyers and interested by-passers required a form of medical advice relating to the type and use of traditional medicines. The herbalist only conveyed advice on the preparation of medicinal plants purchased and in rare cases gave warnings on the toxicity of particular plants if taken in high doses. Methods of use were emphasised when dealing with unfamiliar customers.

Material from an entire plant was hardly used, as chemical compounds vary within the different plant parts. Thus, one part of a plant could be toxic and the other harmless (van Wyk et al. 2000).

This study revealed three main methods of traditional plant preparation. Plants are either:

- Boiled or soaked in water and the extract used for various purposes;
- ground to powder form and the powder used for various purposes; or
- burnt and the powder or smoke used for various purposes.

Various ways of administering medicinal plants include:

- **Steaming**- usually the powder form of the medicinal plant is added to boiling water and used for steaming the body;
- **Lotions**- powders are commonly used, they are mainly mixed with petroleum jelly but can also be mixed with other lotions;
- **Enemas**- water extracts are mainly used; either boiled plant extracts or soaked. This process is done using western (syringes) or traditional (horns) enemas (van Wyk et al 2000);
- **Sprinkles**- plants are used either in powder form (added to water) or extract form, solutions are sprinkled around the yard, business place or area of choice;

f plants is sniffed and is believed to target the central ieved to have an effect on an individuals mental state;

- **Bathing**- the powder form or boiled extracts of plants are more commonly used, by washing the entire body with the solution;
- **Smoking**- the leaves of most plants are ground and smoked to target the central nervous system and an individual's mental state;
- **Burning**- medicinal plants are ignited and the smoke used for various purposes such as removing evil spirits;
- **Planting**-of plants or placing various plant parts in selected locations to eliminate evil spirits and vibrations;
- **Lucky charms**- parts of medicinal plants carried around for luck;
- **Oral administration**-there are six basic methods of oral application;
    - **Emetics**- the powder form of a plant is mixed with lots of water and drank, after which vomiting is self induced;
    - **Drinking**- entails the drinking of certain plant extracts in order to cure various diseases within the body;
    - **Sucking**-entails the sucking of selected plant parts or the powder form of certain plant;
    - **Chewing-** entails the chewing of selected plant parts, specially stem and bark material;
    - **Gurgling**- with extracts from various plant material;
    - **Eating** ï mainly in powder form, commonly added to food and eaten.

A detailed list of species, plant parts used and common uses is presented in Appendix 2.

A wide range of plant parts were supplied by the herbalist (Appendix 3 and Figure3.2). These included the following:

- **Roots**- removal of these plant parts is one of the most destructive methods of harvesting. Often the whole plant is removed or left to die after root removal. Examples in this study included root harvesting of *Alepidea amtymbica, Scabiosa columbaria, Pentanisia prunelloides* and *Bulbine natalensis* plant species.
- **Bark**- high concentrations of active ingredients are found in bark material (van Wyk et al. 2000). Ringï barking (the stripping of bark material around a branch or tree trunk, preventing transport of nutrients throughout the plant and exposing the whole plant to diseases and insect attack) is a major problem in South Africa and has resulted in the scarcity of many tree species such as *Ocotea bullata* (Zschocke et al. 2000). Examples in this study included bark trading of endangered *Ocotea bullata, Prunus africana, Cassine transvaalensis* and 13 other plant species.
- **Bulbs**- Harvesting of slow-growing bulbous and tuberous plants has also become of major concern since harvesting can be destructive and often whole plants are harvested. Ten species in this study were harvested for bulbs, these included *Dicoma anomala, Bowiea volubilis* and *Eucomis autumnalis.*
- **Rhizomes**- Only two species in this study were harvested for rhizomes, *Thesium pallidum* and *Dioscorea elephantipes.*
- **Leaves/ Stems/ Flowers**-These plant parts are usually used together and hardly separated (van Wyk et al. 2000). Recent studies have expressed concern that excess flower collection in selected plant species may have serious implications for reproductive dynamics, thus affecting population dynamics and the reproductive output of future generations. One such example is that of *Protea* species, harvested for trade in both local and international flower markets. To ensure sustainability, only 50% of the inflorescence in *Protea repens* and 85% in *Protea nerifolia* may be harvested (Maze and Bond 1996). Most traditional medicines do not include flower parts although they may be inadvertently

study included *Leonotis leonurus, Artemesia afra* and

- **Seeds**- seeds are rarely used for traditional medicinal purposes (van Wyk et al. 2000). ôLucky beansô from the *Erythrina lysistemon* plant belonging to the *fabaceae* were traded by this particular herbalist. Other examples of seeds that were traded include *Erythrina lysistemon* and *Eucomis autumnalis.*

2.7.3 Customer profiles

There was a significant difference in the number of men and women buying medicinal plants, with males buying more plants than females ($\chi^2 = 15.38$; $p<0.0001$, Table 2.1). Although customers represented all age groups, there was a significant difference in the number of individuals in each age category ($\chi^2 = 41.55$; $p<0.0001$). No individuals under 10 years of age purchased traditional medicine and only one individual between the ages 10 - 20 purchased medicinal plants. Most buyers were between the ages 20 to 35 and older than 35.

Most customers originated from different locations and areas, this distribution was significantly different ($\chi^2 = 18.88$; $p<0.0001$, Table 2.1). Seventy three percent of the consumers lived in urban areas and only 27% were from rural areas. Bias in these results could be due to the fact that interviews were conducted in an urban area setting.

A significant difference in the distributions of marital status was noted ($\chi^2 = 34.37$; $p<0.0001$). Most individuals were either single or married; there was an equal distribution of these two categories. Only 9% of individuals were widowed and 10% divorced.

The Northern Cape has the highest unemployment rate in South Africa at 20% (South African Census data 2001), coupled with the lowest level of education. General statistics for the region show 18% of those older than the age of 20 have no basic schooling, 21% have primary school education, 30% secondary school education and only 6% posses a

rican Census data 2001). Results in this study show a education among consumers (χ^2 = 29.95; p<0.0001, Table 1). A majority of the customers had secondary education (61%). There was an equal distribution among individuals who had completed primary (to grade 7) and tertiary (post-matric) education.

Twenty one percent of individuals interviewed were unemployed. There was a significant difference in the distribution of occupation, with most individuals being civil servants or working for the private sector (χ^2 = 33.78; p<0.0001). Contrary to the study by Cocks (2002) that showed housewives were the main users of traditional medicinal plants, this study found only 2% of individuals to be housewives.

The study represented a significant difference in the frequency of cultural groups existent in the area (χ^2 = 124.56; p<0.0001, Table 1). Fifty nine percent of buyers were Tswana (Setswana) and 16% coloureds and 11% Xhosa. Only one individual was San. Although Afrikaans is the dominant medium of communication in Kimberley, only 22% of customers in this study used Afrikaans as a first language. Most individuals (60%) were Tswana speakers. There was a significant difference in the distributions of languages spoken (χ^2 = 98.58; p<0.0001).

Significantly more individuals interviewed (53%) were both Christian and believed in ancestral worship (χ^2 = 112.50; p<0.0001, Table 1). This was followed by individuals who were primarily Christian (28%). Thirteen percent of the consumers were Rastafarian and only one individual Muslim.

ers. Total number of buyers = 89.

	%		%
Gender		**Age group in years**	
Male	71	<10	0
Female	29	10-20	1
		20-35	49
		>35	**49**
Level of Education		**Occupation**	
Primary	20	Farmer	0
Secondary	61	Housewife	2
Tertiary	19	Civil servant	27
		Self-employed	10
Upbringing		**Private Sector employee**	**2**
Rural	27	Scholar	3
Urban	73	Pension	15
		Unemployed	21
Religion		**Cultural Group**	
Ancestors	14	San	1
Christian	28	Tswana	60
Both	53	Coloured	7
Rastafarian	3	Xhosa	16
Muslim	1	Zulu	11
None	1	Sotho	6
Language		**Marital Status**	
Tswana	61	Single	43
Afrikaans	20	Married	38
Sotho	6	Divorced	10
Zulu	6	Widowed	9
Xhosa	8		

Figure 2.1 shows a list of various plant species used as traditional medicinal plants as well as the ratio of male to female customers. Counts were out of a total of 89 individuals, 26 female and 63 male. Although *pitsa* (mixed herbal remedy) is not a type of traditional plant, for the purposes of this study pitsa is added to the species list as one of the most commonly used traditional mixtures. *Pitsa* is a combination of three different plants species, mooimeisie (*Dicoma anomala*), rumo la madi (*Bulbine natalensis*) and African potato (*Hypoxis hemerocallidea*). The traditional plants that make up this mixture have not been separated, as this would cause a bias in the data (i.e. an equal number using each type). *Helichrysum odoratissimum, Hypoxis hemerocallidae, Dicoma anomala, Polygala hottentota* and *Bulbine latifolia* are the most commonly used species in order of importance.

Customers used traditional plants for various purposes. Most plant extracts purchased were administered for blood purification purposes (24%) (Table 2.2). This was followed by use of plants for the elimination of evil spirits (11%), and provision of good luck (11%). Other customers purchased plants to treat various ailments; the most common were hip problems and diabetes. Others included the restoration of the womb function in female customers and as well as the improvement of fertility in male customers.

There was a significant difference in customer response to the use of herbal remedies as opposed to western medication ($\chi 2 = 84.65$; $p<0.0001$, Figure 2.2). Twenty-nine percent (n = 26) of individuals utilised herbs, as they perceived them as stronger and more natural than western medicines. Twenty percent (n = 18) used both western and traditional medicine, 14% (n = 13) used traditional plants as a result of culture and upbringing and 13% (n = 12) declared western pharmacists ineffective. Seven percent (n = 6) of individuals used herbs as they were perceived to have no side effects or because they were part of divinership training (training to be witch doctors). Only one individual per category used herbs because they either believed in them culturally, could prepare them

e not accessible in pharmacies or because they were .

Fifty eight percent (n = 48) of all customers interviewed, did not collect traditional plants themselves as a result of insufficient knowledge of the material (Figure 2.3). Fourteen percent (n = 12) were full-time collectors and 11% (n = 10) did not have time for collection. Nine percent (n = 8) proclaimed traditional plants to be scarce, 5% (n = 4) declared it unsafe in the field, 3% (n = 3) were too old to collect and 2% (n = 2) collected material infrequently but had run out of supply. One individual complained that harvesting sites were too far and another specified lack of transport as the main limiting factor. There was a significant difference in customer responses regarding sourcing of plants ($\chi 2 = 178.27$; $p<0.0001$).

The frequency of purchasing traditional plants varied significantly ($\chi 2 = 47.40$; $p<0.0001$, Figure 2.4). Most customers, 48% (n = 43) purchased traditional plants frequently (more than 10 times a year), 10% (n = 9) purchased material often (greater than four times a year but less then 10 times), 37% (n = 33) seldom purchased (less than four times a year) and 2% (n = 2) of the individual were first time buyers.

For most individuals the root of knowledge on medicinal plant use was culture and upbringing (52%, n = 46, Figure 2.5), followed by word of mouth (26%, n = 23). Seven percent (n = 6) of individuals were Rastafarian and 8% (n = 7) had an ancestral calling. Eight percent (n = 7) started using traditional medicine through the herbalist and only one individual as part of Muslim tradition. There was a significant difference in the distribution of the source of traditional knowledge ($\chi 2 = 97.54$; $p<0.0001$).

There was a significant difference in customer market preferences ($\chi 2 = 73.20$; $p<0.0001$). Fifty six percent of customers (n = 50) purchased medicinal plants from any herbalist, 37% (33 individuals) only purchased from this specific herbalist, 5% (n = 4) were also collectors and only 2% (n = 2) were first time buyers (Figure 2.6). Twenty six percent of consumers (n = 24) were willing to try substitutes while 72% (n = 64) had

willing to try new traditional medicines serving the e first-time buyers and had insufficient knowledge of traditional plants. There was a significant difference in customer responses ($\chi 2 = 68.52$; $p<0.0001$).

Figure 2.7 indicates the comparison of plant strengths in Kimberley to other areas in the country. Customers were queried on perceptions of plant strengths within regions. Twenty nine percent of customers (n = 26) lacked enough knowledge of traditional medicinal plants to make valid conclusions on plant strengths. Fifty percent of customers (n=40) declared plant strengths to be the same across all South African provinces, 19% (n = 17) declared traditional plants to be stronger in other provinces outside the Northern Cape. Two percent (n=2) declared Kimberley plants stronger than plants in other areas of the country and two percent (n=2) declared plant strengths to vary within regions and that no single region can be concluded to constitute stronger plants than another region.

l plant uses by female and male individuals

Reason for purchase	Total (%)	Gender (%)	
		Male	Female
Appetite inducer	1	1	0
Arthritis	1	1	0
Asthma	1	1	0
Attract money	1	0	1
Bladder problems	1	0	1
Boosts immune system	4	4	0
Bring confidence and charm	1	0	1
Chest pains	3	3	3
Clear dreams	2	1	1
Colds	3	3	0
Diabetes	3	0	3
Eliminate evil spirits	**11**	**8**	**3**
Eliminate tapeworms	1	0	1
Epilepsy	1	0	1
Eradicate sickness	1	1	0
Guidance and protection	1	1	0
Heal wounds	1	1	1
Helps teething babies	1	0	1
High blood pressure	1	1	0
Indigestion	1	1	0
Kidneys and blood purification	**24**	**21**	**3**
Long-term memory	1	1	0
Luck in court	1	1	1
Luck in general	**11**	**10**	**1**
Lung infections	1	1	0
Multi purpose	2	2	0
Pains and aches	2	1	1
Period pains	1	1	1
Pimples sours and burns	1	0	1
Promotion at work	1	1	0
Protection	1	1	0
Restore eyesight	1	1	0
Restore fertility	1	0	1
Restore manhood	3	3	0
Restores the womb	3	0	3
Return spirits to the owner	1	1	1
Sexual diseases	1	1	0
Sinuses	1	1	0
Stomach problems	1	1	0
Stop diarrhoea	1	1	0
Suppressant, calming effect	2	2	0
Ulcer	1	1	0
Waist problems	4	3	1
Total	**100**	**76**	**24**

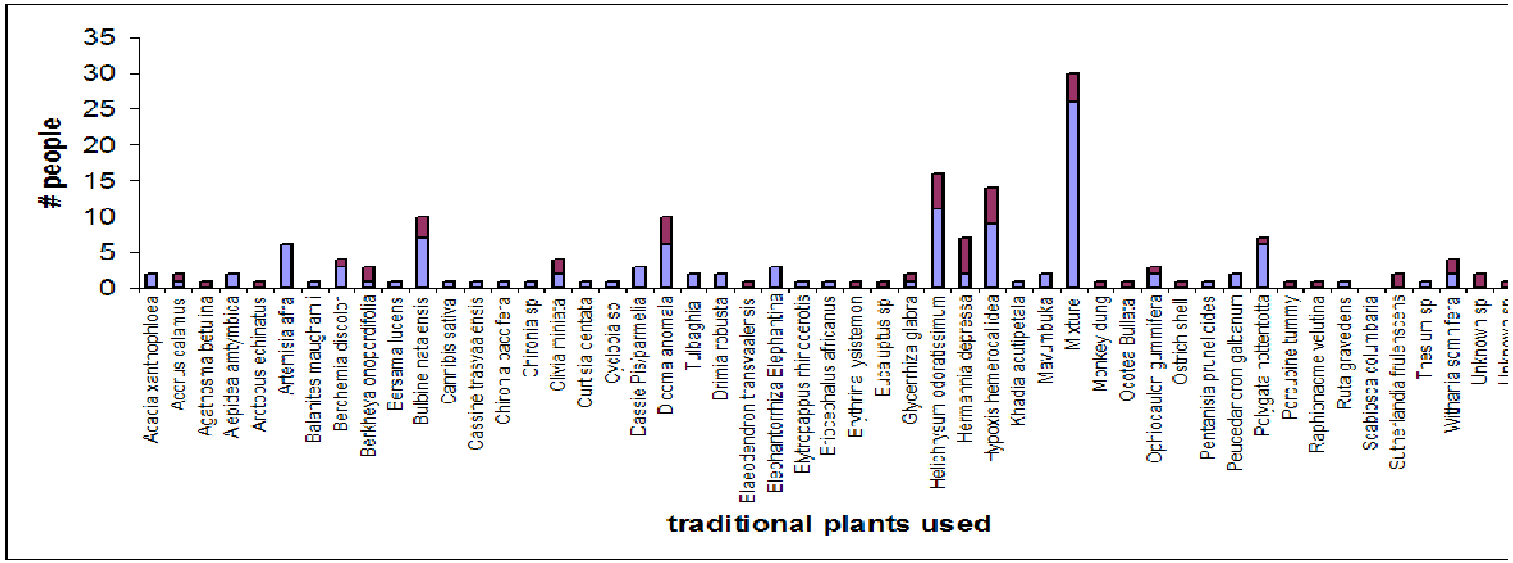

Figure 2.1: The number of male and female customers that purchased various traditional plants. Out of a total of 89 individual, 26 females and 63 male. Pitsa is a combination of three different plants *mooimeisie*, *rumo la madi* and *African potatoe*. The traditional plants that make up this mixture have not been separated, as this procedure would cause a bias in the data. Separation would indicate 28 individuals to have purchased *mooimeisie*, 28 to have *purchased rumo la madi* and 28 to have purchased *African potato*, which is not the case. Although *pitsa* is not a type of traditional plant, for the purposes of this study *pitsa* is added on to the species list as one of the most commonly used traditional mixture.

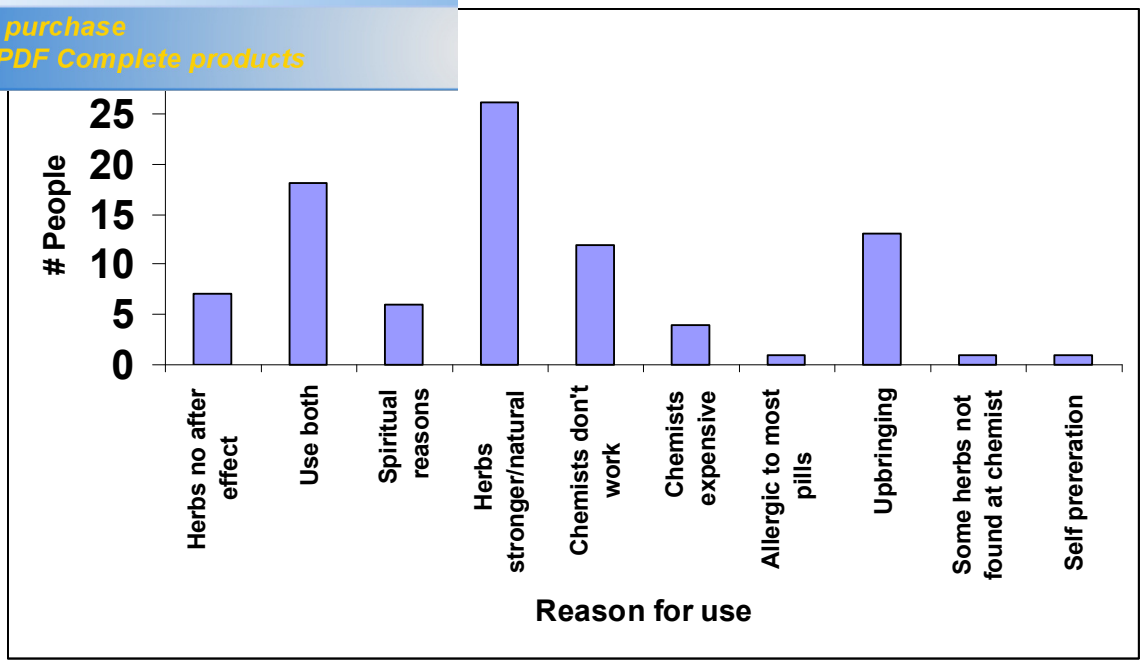

Figure 2.2: Indicating reasons for use of traditional medicinal plant in comparison to western medication. Counts are out of a total of 89 individuals**.**

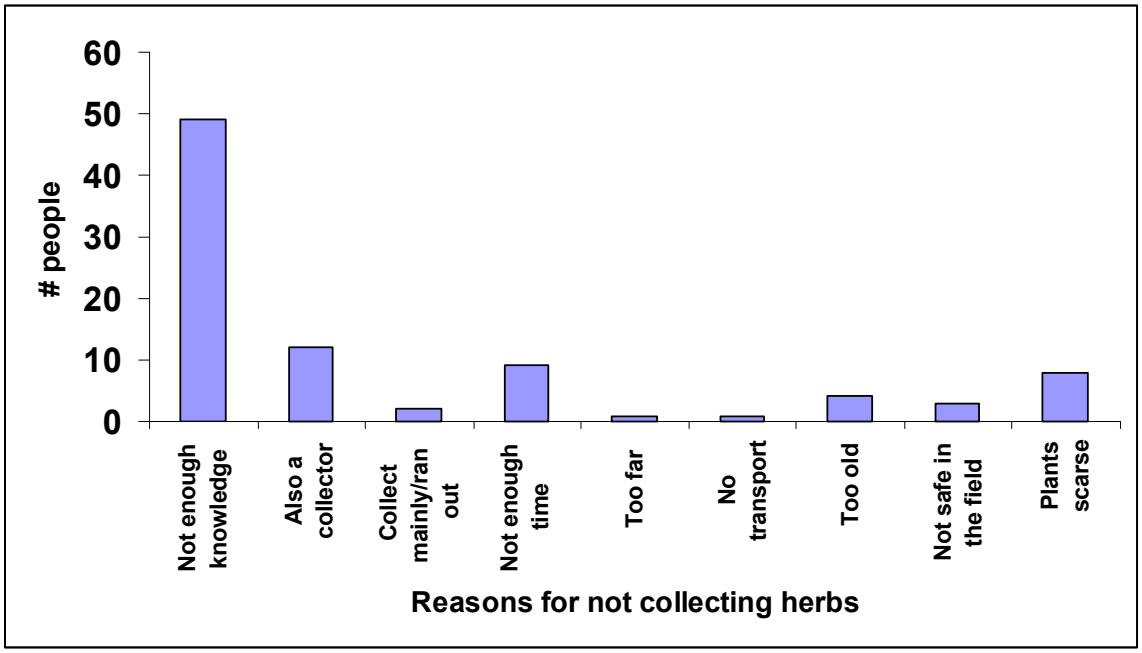

Figure 2.3: Indicating reasons for purchasing medicinal plants and not collecting. Counts are out of a total of 89 individuals

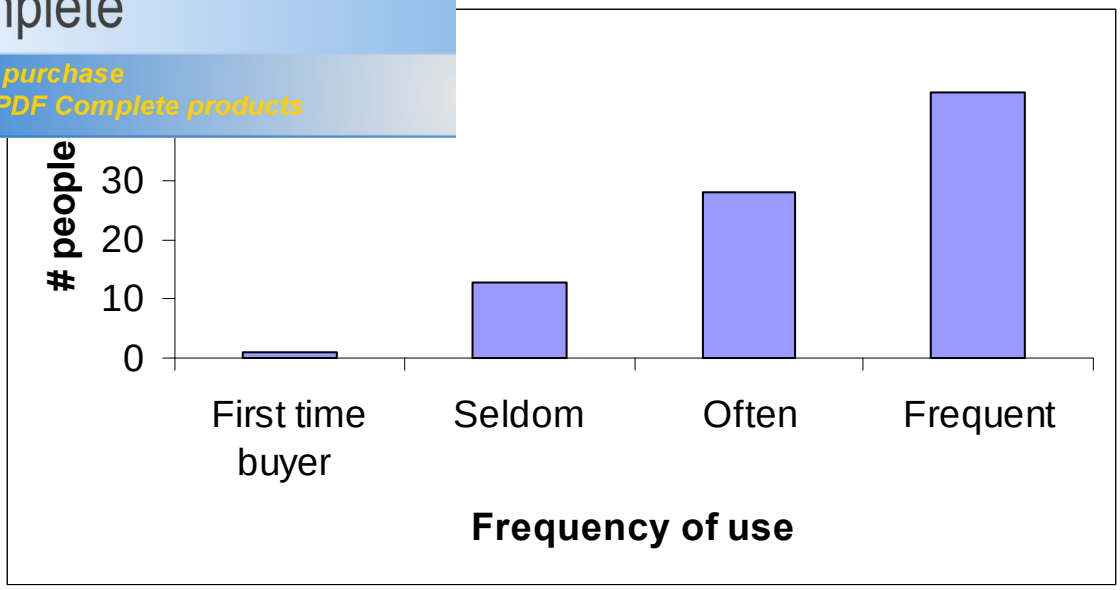

Figure 2.4: Indicating frequency of purchase. Seldom includes purchases less than 4 times a year. Often includes all purchases greater than 4 times a year but less than 10 times a year. Frequently includes all purchases greater than 10 times a year. Counts are out of a total of 89 individuals.

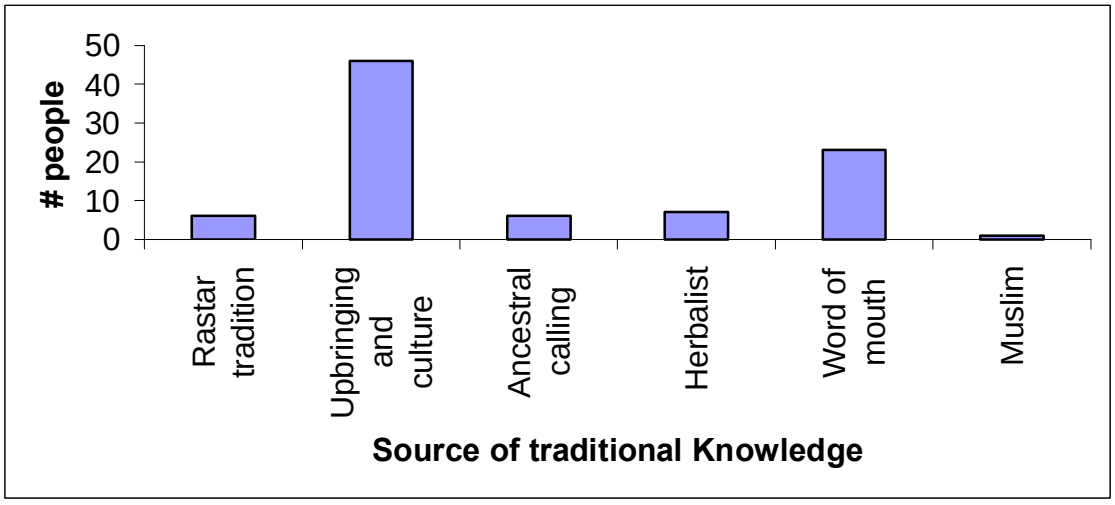

Figure 2.5: Indicated the root and source of traditional knowledge, including knowledge of traditional plants. Counts are out of a total of 89 individuals.

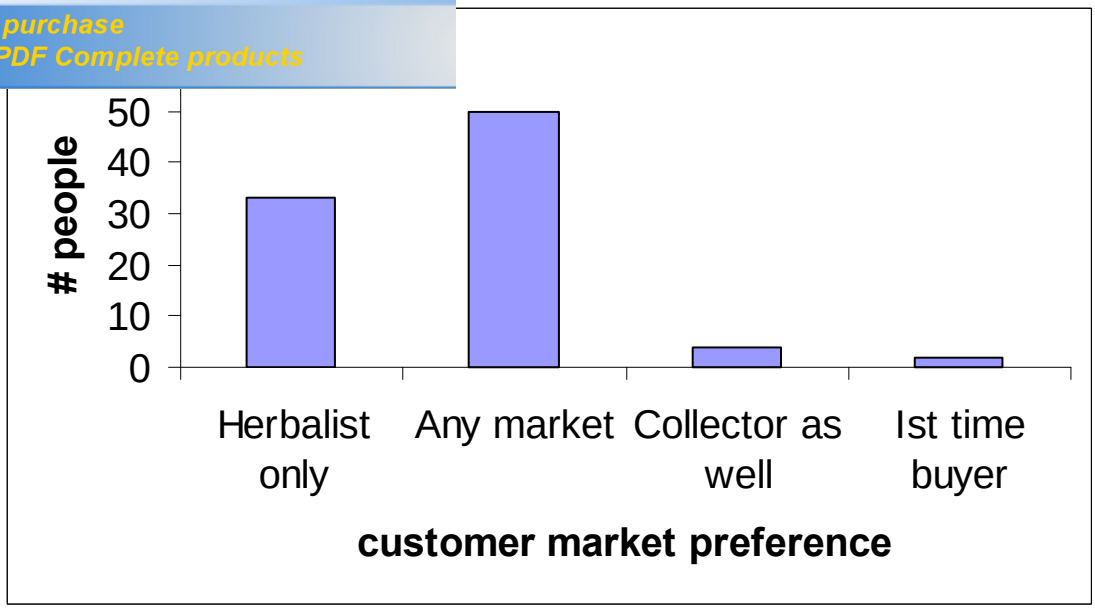

Figure 2.6: Indicating customer loyalty, specificity and flexibility to market areas. Counts are out of a total of 89 individuals.

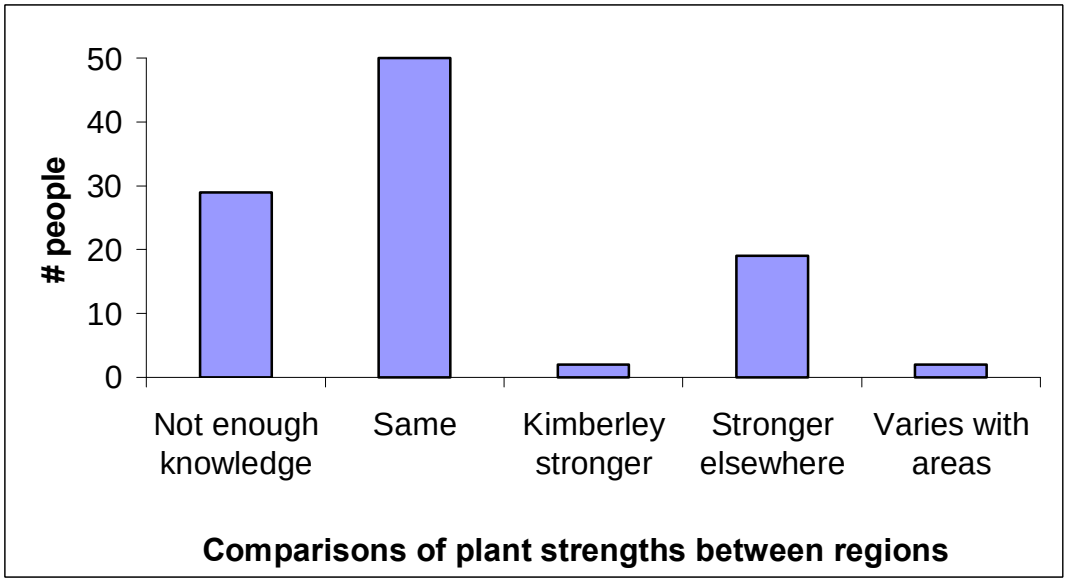

Figure 2.7: Comparison of local traditional medicines (in Kimberley, Northern Cape), to traditional plants elsewhere in the country. Counts are out of a total of 89 individuals.

Figure 2.8 shows comparisons of indigenous knowledge and use of traditional medicinal plants between areas of origin (where people originated) and Kimberley, Northern Cape, (current location). Twenty four percent of customers were from areas other than Kimberley and the Northern Cape. Of these, 56% proclaimed that people in general knew more about traditional medicinal plants in the area they came from compared to knowledge of plants demonstrated in Kimberley and the Northern Cape in general. Thirty six percent declared knowledge and use of plants in the two areas to be the same. Four percent of individuals declared Kimberley residents more knowledgeable, and another 4% declared knowledge and use of plants to vary with peoples skills, training and special calling. Customer perspectives on comparisons between areas, based on plant knowledge and use, were significantly different (χ^2 = 562.02; p<0.0001).

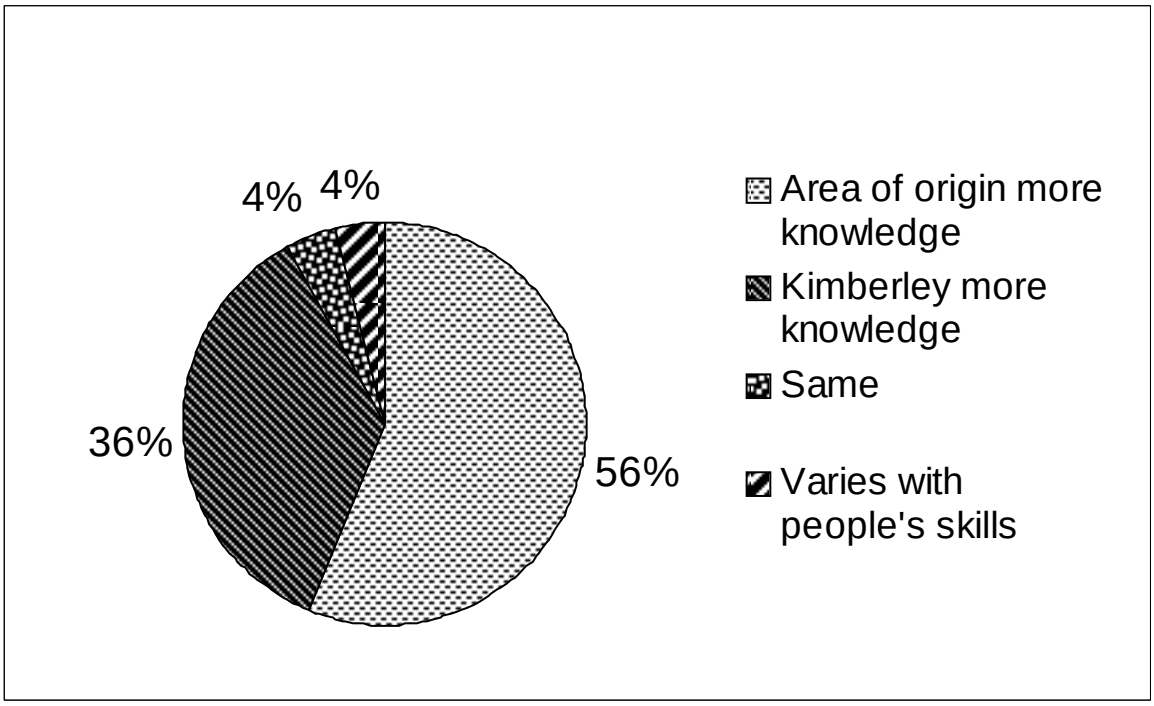

Figure 2.8: Comparisons of indigenous knowledge and use of traditional medicinal plants between Kimberley and emigrated areas. Only 22 (24) people were originally from outside Kimberley**.**

Contrary to various studies (Cunningham 2001, Cocks and Moller 2002, Deiderichs 2006) indicating females as majority users, the majority of purchasers in this study were male. Studies by Cocks and Moller (2002) in the Eastern Cape of South Africa indicated between 66 and 85% of medicinal plants to be purchased by housewives and female professionals. African tradition women generally play a central role in the running of households and are thus tasked with the general protection of such households and individuals residing in them (Cocks and Moller 2002), thus explaining previous findings. In this particular study, males mainly purchased the pitsa mixture administered for blood purification. Women seldom purchased pitsa, as it is often associated with males and perceived as too ñstrongò (concentrated) for females. Females mainly purchased remedies targeting and aimed at restoring specific parts of the body, for example womb restoration.

The purchase of plants for eliminating evils spirits as well as for success is second to use for blood purification. Protective measures are taken in eliminating evil spirits to avoid bewitching, bad luck and illnesses. Medicines taken for luck (charms) are often used in situations of uncertain outcomes to ensure positive outcomes. Medicinal charms are often used in business to ensure prosperity.

Patrons represented all age groups but were predominantly adults between the ages of 20 and 35 and older than 35. They were generally educated (61% had secondary education), employed (59 %) and affiliated with both Christian and ancestral worshiping background (53%). The majority of consumers were not poor (i.e. 53% employed), however they were still dependent on traditional medicines as they were perceived as stronger and more natural (29%). Several individuals used both medical systems (20%) and 14% used traditional remedies as the doctrine was rooted in their tradition and culture and upbringing.

had prior knowledge of and the herbalist seldom ce of knowledge for customers was upbringing and culture (52%), followed by word of mouth (26%). Indigenous knowledge has been passed on from generation to generation over many centuries. The young in communities learn from the elders through participatory observations, fieldwork, as well as story telling. Word-of-mouth is also another major contributing factor to the survival of such knowledge. Individuals residing in the same area often share experiences in relation to cultural practices in general, including medical use. Thus, individuals were often aware and informed about herbal preparation and administration.

Although the herbalist sold a diverse array of medicinal plants, only a few of the species were harvested locally (within Kimberley). Most of the plant material was traded in the form of leaves and stems 32%), followed bulbs (27%, mostly collected locally). Roots and stems were second most popular plant parts used, with percentages of 16 and 9 respectively. Most of the bark material traded, was imported from other provinces in the country. Included in the list of bark material traded, were threatened species such as *Prunus africana*, *Ocotea bulluta*, *Warburgia salutaris* (found in protected areas) and *Synaptolepsis kirkii.* It should however be emphasized that the species were imported from other provinces and do not play a role in this particular study. Of the plant parts traded, the majority collected from the wild, within the area, were in the form of bulbs, tubers, roots and rhizomes (underground parts). Most of these were fast growing species that reproduce vegetatively and were also found in highly disturbed communal areas (chapter 3). The species, *Elephantorrhiza elephantina* and *Helichrysum odoratissimum* for example (in field studies, chapter 3) were found in highly disturbed areas and indicated high survival potentials.

One species that is heavily harvested in the area is the African potato (*Hypoxis hemerocallidea)*, growing naturally in selected locations around Kimberley. However this species was not investigated in detail as part of this particular study. Of particular interest in relation to the species was the proclamation by the herbalist that travelling distances to these wild natural resources had increased considerably over time. The increase in

ral resources may be an indication of the over-

Most individuals (96%) proclaimed the knowledge of traditional medicinal plants to vary with location, i.e. it was highly dependent on where individuals were brought up. The majority of consumers proclaimed knowledge to be stronger in other area and provinces, compared to Kimberley (56%). Traditional plant knowledge is mainly associated with market hotspots, such as Johannesburg and KwaZulu-Natal, with KwaZulu-Natal perceived to have the best knowledge on medicinal plants in the country. Other consumers proclaimed knowledge to be best in nearby surrounding countries, such as Botswana, Swaziland and Mozambique.

The diverse array of medicinal plants traded by the street vendor, from other areas outside Kimberley, is evidence of the importance of such knowledge to the area. The herbalist traded material from other regions and countries to cater for the growing demand of such material locally (a direct representation of medicinal plant use by the locals in the area). The use and knowledge of traditional medicinal plants in most parts of South Africa today, has expanded from local use, to the national use of diverse plant material. Through relocation and resettlement, individuals from various walks of life (employed and residing in urban areas) transmit indigenous knowledge to local areas that become new residential areas. Migration and urbanization are the main contributors to cultural changes as they bring about the contact and exposure of specific cultures to other diverse cultures. Individuals facing cultural adjustments usually respond by either, grouping together and recreating a familiar environment, or by acculturating, adapting and taking up new cultures (Baumann 1998).

Self-medication and use of traditional medicinal plants still plays a major role in Kimberley as the majority of individuals use the herbal remedies as part of culture and tradition. Many continue to use traditional material as it is perceived to be stronger and more efficient than western medication while others prefer using both traditional and western medicines.

Relocation does play a role in the use and knowledge of traditional medicines, as it results in the amalgamation of various cultures, thus offering alternatives to traditional plants used locally. Cultures and traditional practices adapt to those of other local communities and in the process increase the knowledge pool of traditional plant remedies.

A diverse array of plant material was traded, most of which was collected from other parts of the country. Wild harvesting in the area was mostly in the form of underground parts. Although most species sold were not harvested in the area, of particular note was the over-harvesting of the African potato indicated by the increase in travelling distances to the resource. A more detailed investigation on the sustainability of harvesting in the area is carried out in chapter 3, in order to determine whether over-exploitation is a threat to species diversity in the area.

Arnold T., Prentice C., Hawker L., Snyman E., Tomalin M., Crouch N and Pottas-Bircher C. 2002. Medicinal and magical plants of South Africa: An annotated checklist. National Botanical Institute. Pretoria.

Baumann S. 1998. Psychiatry and primary health care: A practical guide for health care workers in South Africa. Juta and Co, Ltd. South Africa.

Cocks M. and Moller V. 2002. Use of indigenous and indigenized medicines to enhance personal wellbeing: a South African case study. *Journal of Science and Medicine* 54:387-397.

Coetzee C., Jefthas E. and Reinten E. 1999. Indigenous plant generic resources of South Africa :160-163 In: Janick J. (ed.). Perspective of new crops and new uses. ASHS Press, Alexandria, VA.

Cunningham A.B. 2001. Applied ethnobotany: people, wild plant use and conservation. Earthscan publications limited Ltd, UK.

Crouch N., Symmonds R., Spring W. and Diederichs N. 2006. Fact sheet for popular medicinal plants. In Diederichs N. (ed.). Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Cunningham A. 2001. Applied ethnobotany: People, wild plant use and conservation. Earthscan publications. UK and USA.

Desmet P. 1997. The role of plant-derived drugs and herbal medicines in healthcare. Drugs 54: 801-840.

ng medicinal plants: A Southern African Guide. Sun

Donald M. and Arthur P. 2002. Botanical Medicines- The need for new regulation. *New English Journal of Medicine*. 347(25): 2073-2075.

Elvin-Lewis M. 2001. Should we become concerned about herbal remedies? *Journal of Ethnopharmacology* 75: 141-164.

Hamilton A. 2004. Medicinal plants, conservation and livelihoods. *Biodiversity and Conservation* 13 1477-1517.

Hutchings A. 1996. Zulu medicinal plants: An inventory. University of Natal Press, Pietermaritsburg.

Koenen E. 1996. Medicinal, poisonous and edible plants in Namibia. Klaus Hess publishers. Windhoek, Namibia.

Mander M. and Brenton G. 2006. Overview of the medicinal plants industry in South Africa. In Diederichs N. (ed.). Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Maze K. and Bond W. 1996. Are *Protea* populations seed limited? Implications for wild harvesting in Cape Fynbos. *Australian Journal of Ecology* 21:96-105.

Reconstruction and Development Program: White Paper discussion document. September 1994. Accessed 13 April 2005. www.policy.org.za.

Pei S. 2002. Ethnobotany and modernisation of traditional Chinese medicine. Paper at a workshop on wise practices and experimental learning in the conservation and

al plants. Kathmandu, Nepal. [Online] 14 April 2005. PA and PPI.

Singh M., Malla S., Rajbhandari S. and Mananohar A. 1979. Medicinal plants of Nepal: retrospects and prospects. *Economic Botany* 3: 185-193.

Statsonline, Population statistics: Census data 2001. Accessed, 15 April 2004. www.statssa.gov.za/census01.

Subrat N. 2002. Ayurvedic and herbal products industry: Paper at a workshop of wise practices and experimental learning in the conservation and management of Himalayan medicinal plants. Kathmunda, Nepal. [Online] 14 April 2005. The WWF Nepal Program, MMAPPA and PPI.

van Wyk B. and Gericke N. 2000. Peopleôs plants. Briza publications. Pretoria, South Africa.

van Wyk B., Outshoorn B. and Gericke N. 2000. Medicinal plants of South Africa. Briza publications. Pretoria, South Africa

Winslow L. and Kroll D. 1998. Herbs as medicine. Archives of Internal Medicine 158: 2192-2199.

Zschocke S., Rabe T., Taylor J., Jäger A. and van Staden J. 2000. Plant part substitution - A way to conserve endangered medicinal plants? *Journal of Ethnobotany* 71: 281-292.

Zschocke S., Drewes S., Bauer R. and Staden J. 2000. Analytical and pharmacological investigation of *Ocotea bullata* (black stinkwood) bark and leaves. *Journal of Ethnopharmacology* 71: 219-230.

CHAPTER THREE

DISTRIBUTION AND SUPPLY OF TRADITIONAL MEDICINAL PLANTS IN KIMBERELY, NORTHERN CAPE OF SOUTH AFRICA: ARE THE RESOURCES SUSTAINABLE?

3.1 Abstract

The international market for traditional medicines is estimated to be increasing at an annual rate of 20%. As a result of the unsustainable harvesting of these natural resources from the wild, the number of traditional medicinal plants that are globally threatened is between 4 160 and 10 000 species. Approximately 99% of the traditional medicinal plants in South Africa are endangered due to over-harvesting and improper harvesting methods. This has major implications for biological diversity, posing a threat to many plant species. The use and trade of traditional medicinal plants, methods of collection and threats to selected harvested species in Kimberley, Northern Cape of South Africa, are investigated in this chapter. Markets are a ñshort listò of a much wider diversity of species. Of the plant material traded six tree species were threatened to over-harvesting in other parts of the country. Five of the species only exist in protected areas and one is listed in CITES Appendix II. Most of the material harvested from the wild was in the form of rhizomous re-sprouters and bulbous plants (often the whole plant was harvested). Although generally resistant to damage and high disturbance levels, these vegetatively reproducing species are bad colonizers if over-exploited, resulting in reduced populations over time. Harvesting of traditional remedies in the area can be concluded as not posing major threats to species diversity, however this particular study indicated certain species to be sensitive to disturbance and to have low survival potentials rendering them vulnerable to over-exploitation. These included *Bulbine natalensis, Withania somnifera, Dicoma anomala* and *Boophane disticha*. Certain species such as *Elephantorrhiza elephantina* and *Helichrysum odoratissimum* responded positively to disturbance.

It is estimated that 80% of the worldôs population uses traditional medicinal plants as a form of primary health care (Mander and Le Breton 2006). The international market for traditional medicines is estimated to be increasing at an annual rate of 20% (Subrat 2002). As a result of the unsustainable harvesting of these natural resources from the wild, the number of traditional medicinal plants that are globally threatened is between 4 160 - 10 000 species (Schippmann et al. 2002). However, the numbers of plants that have become extinct due medicinal plant use are few; one such example is Silphion, a plant formerly found in the Middle East (Lambert et al. 1997).

Foreign markets are also escalating in size, with countries such as Europe and North America growing at 10 to 20% annually (during the past ten years, Pei 2002). Trade in China has increased ten fold in as many years (Pei 2002). As a result of the unsustainable harvesting of natural resources in that country more than 200 plant species have become extinct since the 1950s, and more than 60% of the wildlife species suffer due to habitat loss (Zha and Shao 2002).

More than 1 000 species of medicinal plants are traded in South Africaôs formal and informal market sectors and between 35 000 - 70 000 tons of plant material is traded annually (Diederich 2006). There exists over 30 000 plant species in South Africa, 23 680 of which are vascular plant species, many of which are already rare and endangered (Taylor 1996). This country is one of the richest in the world in terms of species diversity. However over-harvesting is one of many threats to this diversity.

Unlike countries such as China and India, South Africa has not implemented systems for large scale cultivation of medicinal plants to meet the growing market demand of herbal plants (Zschocke et al. 2000). Approximately 99% of traditional medicinal plants traded informally or formally in South Africa are harvested from the wild (Williams 1996, Mander 1998, Cunningham 2001). Of the wild stocks, 80% are likely to die as a result of improper harvesting practices (Mander and Brenton 2006).

to over-exploitation, are popular, slow-reproducing that are geographically limited (Cunningham 1998). Thirty two percent of the most commonly used plants in South Africa are trees (van Wyk et al. 1997) and of the tree species, 83% have their bark harvested. A case study in the uMzimkulu District of South Africa indicated an average of 20 - 40% of species had their bark intensively removed and trees ring barked (Geldenhuys and Mitchell 2006). This is a major problem in South Africa and in other parts of the world and has resulted in the decline of many tree species. As a result of improper harvesting techniques, 80% of trees from various forests within the country have been over-harvested and are gradually disappearing (Mander and Breton 2006). This includes threatened plant species such as *Ocotea bullata*, one of the top ten commonly used plants in KwaZulu-Natal (Zschocke et al. 2000) and *Warburgia salutaris* a species restricted to a few protected sites in South Africa.

A study by Geldenhuys and Mitchell (2006) has indicated that it is not the actual harvesting of plant material that results in over-exploitation but the mechanisms and ways of harvesting. Research in the Knysna-Tsitsikamma forests of South Africa, indicated that the harvesting of bark in narrow vertical strips around the stem ensured greater survival compared to the stripping of bark around the trunk. In addition, the study indicated species exhibited different responses to harvesting (Geldenhuys and Mitchell 2006). *Ocotea bullata* for instance, responds negatively to harvesting and most plants left standing are likely to die, however species such as *Prunus africana* and *Ilex mitis* easily re-grow cambium on debarked woods (Geldenhuys and Mitchell 2006). Other plant species that have good recovery rates include *Albizia adianthifolia, Curtisia dentata* and *Prunus africana.*

Slow-growing bulbous and tuberous plants are second on the list in terms of vulnerability to exploitation. Underground parts, especially roots, tend to be rich in nutrients and secondary plant chemicals and are often used as medicinal plants. The main concern with the harvesting of these plant parts is the digging out or harvesting of whole plant material, and secondly, the difficulty in tracing and investigate such harvesting. The only source of

plant parts are holes in the ground and in many cases, ce. Even less data are available on the harvesting of these plant parts although information of plant depletion is available. The increasing scarcity of these types of material has resulted in the increase in the market prices of the plants, which in return acts as incentives for further harvesting (Cunningham 1998).

With stem harvesting, re-sprouting plays a major role in the resilience of the actual plants to disturbance. Stem harvesting can reduce the reproductive output of a plant population, however this is concern in single-stemmed plants rather than multi-stemmed plants (Cunningham 2001).

The harvesting of flowers and fruits is generally perceived to have the lowest impact on plant populations. However, harvesters often use destructive harvesting techniques that destroy other parts of the plants. The collection of flowers and fruits is often linked with the destruction of branches and even the felling of plants in order to reach inaccessible parts (Cunningham 2001). Recent studies have also expressed concerns that excess flower collection in selected plant species could have serious implications for reproductive dynamics, affecting population dynamics and the reproductive output of future generations (Maze and Bond 1996). A good example is that of *Protea* species. Because re-seeder species can be seed limited (Bond and Maze 1996), special care has to be taken in harvesting their flowers, fruits and seeds, especially for species producing a few large seeds (Cunningham 2001).

The increase in harvesting of wild material is attributed to the increase in international and local market demand of such material (Mander and Breton 2006). There has been an upsurge in the use of traditional medicinal plants in South Africa, resulting in the establishment of more market places, coupled with the expansion of some markets. Large urban markets are centred in Johannesburg and Durban (Mander 1998). Smaller markets are located in urban and rural areas across the country. In urban areas, markets tend to be located around the busiest locations such as taxi ranks and other local markets. Rural

markets or pension pay out points (areas for trading)

The non-sustainable use of traditional medicinal plants stems from their intense harvesting from the wild to supply the high demands from urban and rural markets. As a result of the fast population growth, high rural unemployment, and value attached to traditional medicinal plants (socio-economic factors), the national and regional trade of traditional medicines is currently greater than it has ever been (Cunningham 1998). Another reason for the increased threat to traditional medicinal plants is the degradation and weakening of customary laws that have previously regulated such resources. A classic example is the over-exploitation of *Prunus africana* in Cameroon (Cunningham ad Mbenkum 1993), the exploitation of the species was directly linked to the collapse of customary systems in the area (Cunningham et al. 1997).

In order for traditional medicinal supply to be aligned with demand and to prevent the over-exploitation of natural resources, various mechanisms have to be put in place. These include conservation practices such as the management of wild stocks (through education, community involvement and various other practices); plant monitoring; implementation of standards and regulations for wild natural resources; and lastly, the implementation of cultivation practices to remove pressure off wild natural resources (especially species that are intensively harvested and popular).

3.3 General aims and objectives of the chapter

The general aims and objectives of the study were to:

- Investigate harvesting techniques and to note if sustainable practices are implemented;
- Investigate plant material traded (plant parts used) to note if species are sustainably harvested; and
- Investigate price changes and changes in quantity of material traded, as measures of resource availability and sustainability;

arvesting on sustainability. This is investigated at a
l in the area) and through market trade (i.e. various material traded were from other areas in South Africa); and

- Investigate the survival potential of species collected in the Kimberley area, to note if any of the species are vulnerable to over-exploitation.

3.4 Research Methods

The study was conducted in Kimberley, Northern Cape of South Africa, in two phases, both running over a period of two weeks. Phase 1 of the study was conducted during the summer month (October) of 2003. Three data collection methods: questionnaires (Appendix 1), participatory observation, and botanical specimen identification were used during this phase of the study. Chapter two of this thesis deals primarily with these results and focuses on resource use, users, indigenous knowledge and transfer as well as implications of resettlement on plant use.

As part of the questionnaire used during phase 1 of the study, 89 customers were queried on price changes excluding inflation (i.e. relative to the price of other basic products such as bread). Customers were also queried on the amount of material sold over the past ten years. The price of natural resources is a good measure of resource availability (Mander et al. 2006). The scarcer the resource, the more time and money one has to invest in finding it, therefore an increase in travelling cost and time spent and as a result the increase in selling price. In addition, the scarcer a resource, the smaller the quantities of material traded. Individuals were also questioned on the plant parts used as this plays a major role in determining sustainability.

Phase two of the study was conducted during February 2004. Phase two comprised of vegetation sampling and participatory observation of various plant collectors, noting collecting methods and areas of collection. Fieldwork was conducted with the help of a Ratafarian herbalist; one of two medicinal plant traders who sold medicinal plants informally in the Kimberley city centre.

st of the plant material he sold (local species), he also for material, including Rastafarian associates that collect plants for everyday use and as part of culture and tradition. Most of the collection took place around Kimberley, especially in relation to the collection of bulbous species, however the herbalist also travelled at least twice a year to neighbouring provinces to collect plants not found in the area. Given the diverse cultures presented by the Kimberley city centre, the herbalist often asked other collectors, healers or associates to procure material for him from other provinces or places or origin.

The herbalist facilitated introductions to the various plant collectors. The collectors were willing to take part in the study and were also willing to share their knowledge with regard to collecting sites and methods of collection. Methods of collection were documented based on participatory observation.

Five of the sites visited (sites 1 ï 5, Table 3.1, Figure 3.1) were selected by the collectors with target species in mind as these were the areas where the species were most abundant. Other medicinal plants falling within the selected sites were also investigated.

Sites 1 ï 5 included:

(1) Two sites outside Riverton, located North East of Kimberley;
(2) One site located on the old Transvaal road between Riverton and Kimberley i.e. North East of Kimberley (Riverton 3);
(3) One site in Blaaubank next to Barkly West (north east of Kimberley); and
(4) One site within the Galeshewe Township, south-west of Kimberley.

Target species for each of the sites (1 ï 5) were:

(1) *Bulbine natalensis, Talinum* species and *Thesium palidum*;
(2) *Tulbaghia* species;
(3) *Elephantorrhiza elephantina;*
(4) *Harpagophytum procumbens, Dicoma anomola, Thesium palidum* and *Boophane disticha;* and

The remaining eight sites were selected within different habitats and tenure systems (private farms and communal) within Kimberley (Table 3.1, Figure 1.1). Sites 6 ï 11 included:

(1) Two sites located within the Pniel communal areas; and

(2) Five sites located within the Pniel game farm.

The Kimberley area is characterised by three main types of tenure systems. Cattle grazing, game grazing/browsing and communal grazing. The Pniel game farm is a game grazing/browsing farm located to the northwest of Kimberley and the Pniel communal area is located directly next to the game farm. A PhD study on the effects of management strategies on vegetation structure in the Savanna, conducted by Mari-Louse Britz within the Kimberley area (2004), indicated that of the three tenure systems, the most degraded was the communal area. The thesis indicated that this tenure system generally had the highest percentage of woody vegetation, including high percentages of *Acacia erioloba, Tarchonanthus camphoratus* and *Grewia flava*, compared to the other two tenure systems. High percentage covers of these woody species are an indication of bush-encroachment and land degradation in this area. An investigation on management strategies also indicated an insignificant difference in vegetation structures between the cattle grazing and game grazing/browsing tenure systems, i.e. there was not much difference in the level of woody species between the two tenure systems. The commercial farm selected for investigations on the response of *Elephantorrhiza elephantina* to disturbance was a cattle-grazing farm located northeast of Kimberley. Contrary to the PhD study, this particular research indicated high local degradation levels in the particular cattle farm investigated. Although the farm consisted of few woody species (not encroached), it appeared to have been cleared and comprised very little natural vegetation.

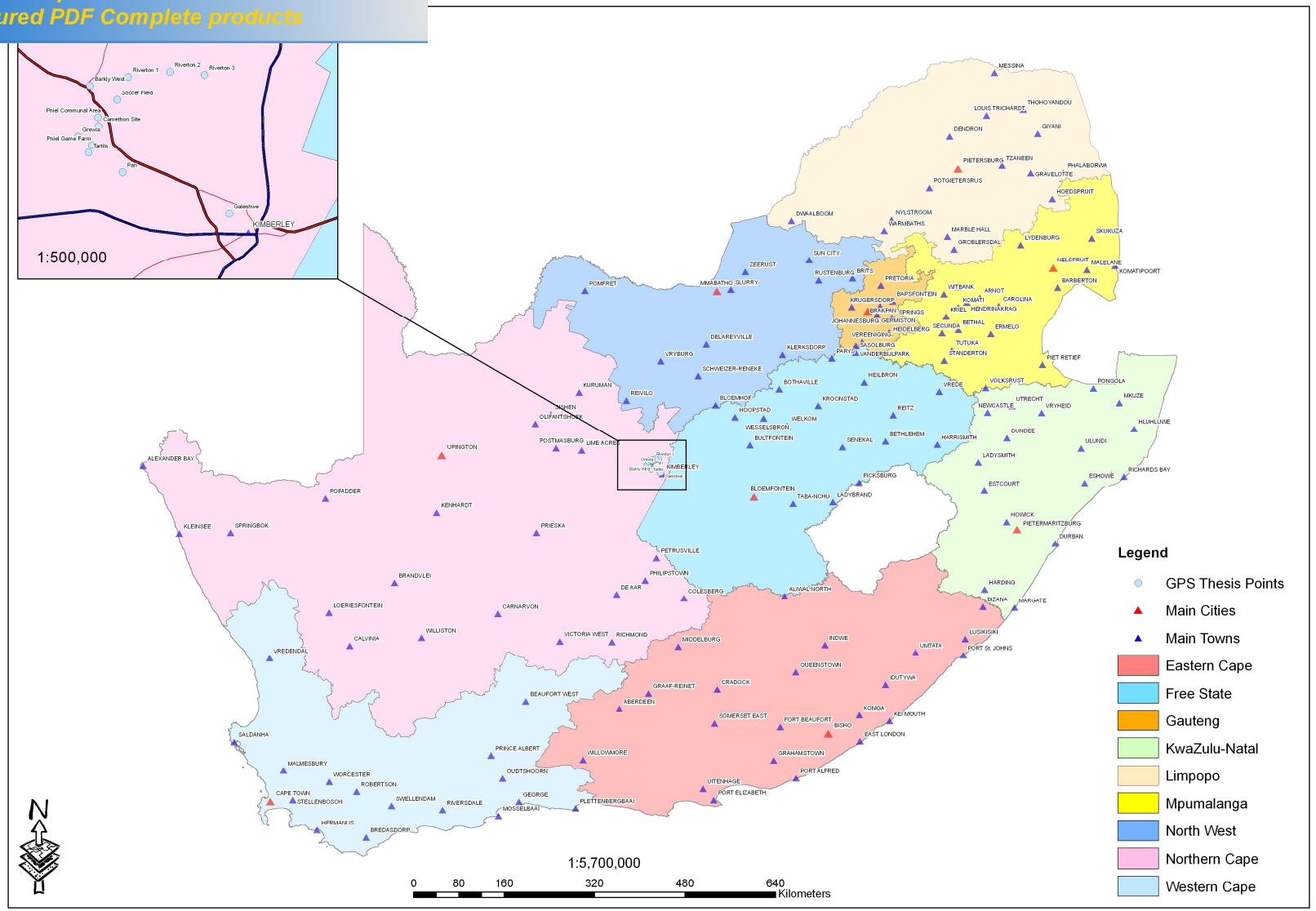

Figure 3.1: Showing the distribution of the sites investigated

the selected sites, presenting general vegetation and habit information, levels of disturbance (Key used

Site #	Long/Lat	Site name	Reason for selection	General veg. description	Level of disturbance	#Transects
1		Riverton 1	*Bulbine natalensis,* *Talinum* sp. and *Thesium palidum*;	*Acacia tortilis* <5% *Asparagus* <1% *Pentsia incana* <40% *Thesium palidum* <1% *Ziziphus mucronata* Bare cover 25%, deep red soils	4	5 (100 m)
2		Riverton 2	*Tulbaghia* sp.	*Acacia erioloba* 5% *Acacia tortilis* 10% *Chrysochoma* sp. *5%* *Grewia flava* 10% Total grass cover 40% Bare cover 20%, deep red soils	3	5 (50 m)
3		Transvaal Road	*Elephantorrhiza elephantina*	*Acacia erioloba* 10% *Acacia melifera* 5% *Elephantorrhiza elephantina* 20% Total grasses cover 35% Bare cover 30%, deep red clay soils	5	2 (100 m)

		eason for selection	General Veg. description	Level of disturbance	#Transects
4	Blaaubank	*Harpagophytum procumbens* *Dicoma anomola* *Thesium hystrix* *Boophane disticha*	*Acacia melifera* 40% *Acacia tortilis 10%* Grasses 15% Succulents 5% *Tarchonanthus* 5% Bare ground 10% Rock cover 15%, hilly rocky habitat	2	9 (50 m)
5	Galeshewe	*Senna italica* and *Helichrysum odoratissimum*	*Acacia erioloba* 5% Total grasses cover 49% *Ziziphus* sp. 5% Bare cover 40%, brown clay soils	5	5 (50 m)
6	Pniel Comm area	*Acacia erioloba* woodland	*Acacia erioloba* 20% Acacia melifera 2% *Acacia tortilis* 1% *Chrysochoma* 2% *Grewia flava* 20% Total grass cover 25% Bare cover 30% deep red soils	3	5 (50 m)

		eason for selection	General Veg. description	Level of disturbance	#Transects
7	Pniel Game Farm	*Acacia erioloba* woodland	*Acacia erioloba 20%* *Acacia melifera* 1% *Acacia tortilis 2%* *Grewia flava* 10% *Tarchonanthus camphoratus* 2% Total grass cover 35% Bare cover 30%, deep red soils	3	1 (100 m)
8	Pniel Game Farm	*Acacia - tarconanthus* woodland	*Acacia melifera* 5% *Acacia tarchonanthus* 25% *Acacia tortilis* 5% *Grewia flava* 10% Bare cover 30%, deep red soils	3	1 (100 m) and 1(170 m)
9	Pniel Game Farm	*Acacia tortilis* Woodland	Acacia erioloba 3% *Acacia tortilis* 20% *Grewia flava* 2% *Tarchonanthus camphoratus* 5% *Othona sp.* 5% Total grass cover 30% Bare cover 45%, deep red soils	3	2 (100 m)

Site #	Long/Lat	Site Name	Reason for selection	General Veg. description	Level of disturbance	#Transects
10		Pniel Game Farm	*Acacia mellifera* Woodland	*Acacia erioloba* 2% *Acacia mellifera 25%* *Acacia tortilis* 15% *Grewia flava* 2% Total grass cover 16% Rock Cover 40% Bare cover 10%, red soils-rocky	3	2 (100 m)
11		Pniel Game Farm	Pans	*Chrysochoma* 6% *Drosanthemum sp*<1 *Pentzia sp.* 5% Perdebos 15% *Pteronia sp.* *Salsola* 10% *Thesium palidum* *Trichodiadema* (imperdebos)<1% *Zygophytum* 2% Bare cover 55% White-red soils with calcrete	3	2 (100 m)

			eason for selection	General Veg. description	Level of disturbance	#Transects
11	Pniel Communal Area	Communal area		*Acacia erioloba* 2% *Chrysochoma* 7% *Tarchonanthus camphoratus* 1% Total grass cover 55% Bare cover 40% Deep red soils	3	2 (100 m)

Classification of disturbance levels

1 - Pristine habitats, not disturbed in any way

2 - Low levels of disturbance, with very little visual impact on wild stocks, i.e. very few plants harvested and little signs of grazing

3 ï Average level of disturbance, moderate levels of harvesting and grazing by livestock.
Although not a threat to species diversity, could have serious implications in the future diversity of species.

4 ï Higher then average levels of disturbance, due to high levels of harvesting and grazing, especially in communal areas as a result of the ñtragedy of the commonsò. ñTragedy of the commonsò is the degradation of land and natural resources as a direct result of the joint ownership of land by individuals in communities (mainly rural communities). In such cases individuals have little responsibility or power for the state of their natural resources, this allows individuals in the community or outsiders to exploit medicinal plant populations (Mander 1997).

5 ï High levels of disturbance; heavily degraded and exploited.

urvival of selected species to harvesting, a sensitivity red the following components of resilience:

A) Disturbance of the sites in which the target species are present. The disturbance is any phenomenon either natural or unnatural that has a direct effect on plant populations and species dynamics. Natural disturbances include occurrences such as fires and droughts, and the life histories of most species are linked to such events (Cunningham 2001). Induced disturbances include events such as grazing and plant harvesting. Of importance are the actual scale, frequency and intensity of disturbance for a particular species or habit (Cunningham 2001). Harvesting impacts and disturbances are reliant on the vegetation dynamics and structure of certain species. The harvesting of long-lived bulbs and tree species in grassland for example, can return habitats to previous succession states (Cunningham 2001). It is important that plant population structures as a result of disturbance be taken into account when assessing harvesting impacts on species over time (Cunningham 2001).

B) Density of the target species. The density was calculated by counting the numbers of plants (per species) within a belt transect and dividing the total number of plants found by the total area sampled.

C) Distribution of the target species. The distribution of a species is the spread of the species across various habitats. As simply phrased by Cunningham (2001), it is ñhow much is out thereò, the rareness and reasons for such patterns. There are various levels of distribution, i.e. local, national and international. This study primarily focuses on the local distribution (restricted to the sites investigated) of selected species in the Kimberley area. However, the national distributions of the selected species are also included; these were derived from existing literature (van Wyk et al. 1997).

D) Growth response is the response of plant species to disturbance. This mainly ties in with the way in which plants reproduce. Categorizing plant species on a continuum scale from re-seeders to re-sprouters, gives very good insight on the sustainability of the

of the selected species in this study were in the form (re-sprouters). Rather than build up seed banks, the species investigated reproduced vegetatively and either responded to disturbance by re-sprouting and producing new stems from buds or producing new scale leaves seasonally. Both growth forms have a competitive advantage in frequently disturbed vegetation types such as the savanna and other fire maintained grasslands. As a result of the high competitive nature of these growth forms, they tend to be generalists and are widespread and easily available. However, distribution is highly reliant on harvesting pressures. Although generally resistant to stem and underground storage organ damage, these species tend to be poor colonisers if over-utilised and populations can decline in the long-term (Cunningham 2001). This is one of the main reasons why root harvesting and the harvesting of whole plant material is of main concern, specifically in the Kimberley area where most medicinal plants collected are in the form of underground storage organs. Once the parent plant dies through root removal or the removal of the whole plant, re-establishment from seeds is a rare event (Cunningham 2001).

For the purposes of the study, growth response was scored from 1-5, from the least response to disturbance to the most positive, ódisturbance lovingô species.

1. Plants responded negatively to disturbance and do not exist in areas of high disturbance. This class mainly comprises of plants restricted to pristine environments.
2. Plants reacted negatively to disturbance, however, can occur in small densities in disturbed areas.
3. Plants react moderately to disturbance and occur in disturbed environments.
4. Plants react positively to disturbance and occur in high densities in such areas. Mainly fast growing species that still prefer the co-existence of other competitors for survival.
5. Most abundant in the disturbed areas, plants positively correlated to disturbance. Mostly fast growing and highly competitive species.

e ability of a species to absorb disturbances, i.e. it is or equilibrate after disturbance (Holling 1973) and survive.

For the purposes of this study, survival potential is calculated as:

Density * Disturbance * Distribution * Growth response.

Species with high survival potential have the lowest sensitivity to harvesting and would therefore be the least vulnerable to over-harvesting and exploitation.

3.5.1 Traditional medicinal plants traded

The traded material comprised of medicinal plants harvested locally, nationally and in some rare cases from surrounding countries such as Mozambique, Swaziland, Botswana and Lesotho. Trade of medicinal plants is complex, starting from the harvesting of material from wild stocks to final use as medicinal plants (Cunningham 2001). The chain in market trade is interlinked and local markets (such as in Kimberley) have a direct effect on national markets and vice versa. Thus, the plant material traded in the Kimberley area is linked to market trade in other areas of the country and is governed by the same demand and supply parameters at a much wider scale. In this particular study some species traded are in high demand across the country and are heavily exploited. Although the trade of these medicinal plants does not pose threats to species diversity within the Kimberley area, it certainly plays a major role in the sustainable harvesting of species at a national scale.

Of the traditional medicinal plants traded, 32% were in the form of leaves and stems, closely followed by bulbs at 27%. Roots and stems were second in line of trade, at 16 % and 9% consecutively. There was a significant difference in the number of plant parts traded in each category ($\chi^2 = 22.67$; $p<0.01$). Five non-plant traditional medicines were also purchased for various medicinal purposes. Figure 3.2 below represents the plant parts traded by the particular herbalist.

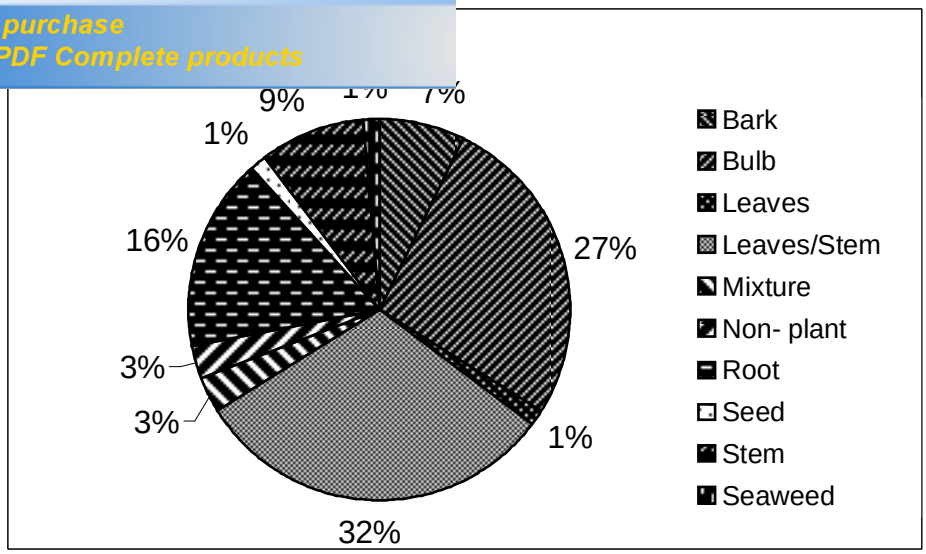

Figure 3.2: Frequency of plant parts traded

3.5.2 Harvesting sites and modes of collection

Plants harvested by the collectors were mainly from communal areas, primarily used as common grazing grounds for livestock. Collection of plant material from private lands also took place in the area; however, such practices were done in secrecy due to issues relating to restricted access. Bulbs, rhizomes and a few leaves and stems were harvested in the area. Sections of the stems in rhizomatous plants were harvested using knives. In the case of *Elephantorrhiza elephantina,* for example, sections of the stems were cut using a knife and the rest of the plant left intact. With the bulbous species, often the whole plant was pulled out using instruments such as a shovel or any type of sharp object. The Rastafarian herbalist used different harvesting techniques to the other collectors. Nature preservation is a fundamental part of Rastafarian tradition and sustainable harvesting techniques are deployed, for example, the harvesting of selected material leaving the rest of the plant intact.

Observations on harvesting techniques for the purposes of this study were restricted to selected species (target species) and sites. Species investigated included *Boophane disticha, Bulbine natalensis, Dicoma anomala, Elephantorrhiza elephantina, Harpagophytum procumbens, Helichysum odoratissimum, Senna italica, Talinum sp.*

.. Characteristics of the selected species are detailed from the following sources: Hutchings 1996, Koenen 1996, van Wyk et al. 1997, van Wyk and Gericke 2000, Cunningham 2001, Arnold et al. 2002, van Wyk and Wink 2004, Diederichs 2006.

Bulbine natalensis

Common Name:	Rumo la madi/Rooivortel.
Distribution:	Widely distributed in the Eastern Cape and northern parts of South Africa.
Plant Use:	Roots boiled and the extract orally taken for blood purification and the treatment of various ailments such as diabetes and urinary problems.
Plant Part:	Roots.

Talinum caffrum

Common Name:	Punyuka ba mphethe.
Distribution:	South African distribution not specified but also occurs in Botswana and Namibia.
Plant Use	Plant material ground to powder form and eaten to cure kaffir poisoning (oral poisoning from bewitching) and other digestive problems. The material can also be boiled and the extract used in vomiting rituals or ground to powder form and sprinkled around the yard for protection.
Plant Part	Roots.

Common Name:	White maisale./ Purging nut.
Distribution:	Restricted to the dry and central part of South Africa. Mainly found in the Northern Cape and North-West provinces. Also occurs in the Eastern Cape and Orange Free State provinces.
Plant Use	Burnt and inhale to restore the central nervous system. Can also be carried around as lucky charms.
Plant Part	Rhizome.

Tulbaghia sp

Common Name:	Wild garlic.
Distribution:	Occurs throughout the Cape provinces of South Africa.
Plant Use	Boiled and extract used for the relief fevers. Also planted in households as a snake repellent.
Plant Part	Bulb.

Elephantorrhiza elephantina

Common Name:	Mosetsana/ Elandsbean.
Distribution:	Widely spread across South Africa. Existent in the Northern Cape province, Eastern Cape province, KwaZulu Natal province, Free state province, North West province, Limpopo province, Gauteng province as well as the neighbouring countries such as Swaziland and Lesotho.
Plant Use:	The plant is usually sliced and boiled and the extract used as a blood purifier and for the cure of various ailments such as high blood pressure, tonsillitis and kidney failure. The extract is also used for relieving itchiness and clearing the air canal.
Plant Part:	Underground rhizome.

Common Name: Devilôs claw.

Distribution: Mainly found in the Northern Cape and sandy places in the north-western part of the country, also found in the North West province and the Limpopo province.

Plant use: The plant material is usually ground to powder form and added to various foods or sliced and boiled and the extract used to cure all kinds of disease. The material is also a good source of vitamins.

Plant Part: Root.

Dicoma anomala

Common Name: Thlwenya.

Distribution: Mainly found in the Northern Cape, i.e. restricted to the dry interior of South Africa. Species found in sandy disturbed soils.

Plant Use: Plant material sliced and boiled to cure colds or ground to powder form and used to cure various ailments such as kidney, bladder, prostate and womb problems. Also used to enhance fertility and as a sexual stimulator.

Plant Part: Leaves and stems.

Boophane disticha

Common Name: Leshomelo/ Bushman poison bulb.

Distribution: Widely spread in other provinces especially towards the south eastern parts of the country, however limited to north east and south west of Kimberley.

Plant use: Used as an antiseptic for sours, cuts and surgical wounds also used to prevent over-bleeding.

Plant Part: Bulb/leaves.

Common Name:	Mpepho/ Everlasting.
Distribution:	All over South Africa.
Plant use:	Burned and smoke and ashes use to eliminate evil spirits and vibrations. Also inhaled for the soothing of chest pains.
Plant Part:	Leaves and shoots.

Senna italica

Common Name:	Swaartstorm.
Distribution:	South Africa in the North West Province, Limpopo Province, Gauteng, the Free State Province, KwaZulu-Natal Province and the Northern Cape Province. Also occurs in Swaziland, Namibia and Botswana.
Plant Use	Used for various stomach treatments, including administration as a purgative and use as a laxative.
Plant Part	Roots.

Additional species found in sites (6-12)

Withania somnifera

Common Name:	Ubuvimba/Indian ginseng.
Distribution:	Widely distributed in South Africa and has become a weed of disturbed areas (van Wyk et al. 1997).
Plant Use	Sliced and boiled, used as a blood purifying agent (mostly women) and for cleansing the womb and bladder.
Plant Part	Rhizome.

Common Name:	White Onion.
Distribution:	Widely distributed in parts of South Africa and Lesotho. Abundant in open grassland type vegetation, especially within the Northern Cape Province.
Plant use	Kidney and blood purification.
Plant Part	Bulb.

3.5.3 *Changes in price and quantity of material traded as indicators of sustainable harvesting*

Figure 3.3 shows customer perceptions on price changes with regard to traditional medicinal plants over the past ten years, with inflation taken into account. Fifty nine percent of customers declared the price of traditional medicinal plants to be fairly stable, with very little changes over the past ten years, 33% declared prices to have gone up, 6% did not have enough knowledge to make valid assumptions, 1% pronounced prices to have decreased and 1% pronounced prices varied with location, market places and herbalists. There was a significant difference in perceptions of price change ($\chi^2 = 76.71$; $p<0.0001$), with the majority of people indicating that prices have remained relatively stable. This indicates that the price of medicinal plants traded in the area had remained fairly stable over the last ten years.

There was a significant difference in customer perceptions ($\chi^2 = 115.45$; $p<0.0001$, Figure 3.4) with regard to quantity of plant material traded over the past ten years. Seventy three percent of customers claimed amounts of material purchased to have been stable over the past 10 years, 13% proclaimed amounts to be decreasing with time, 7% declared an increase and 6% lacked enough knowledge to make valid conclusions on price change. Only 1% of the customers announced prices to differ depending on the area of purchase as well as the herbalist. This indicates that the quantity of material traded in the area has remained stable over the past ten years.

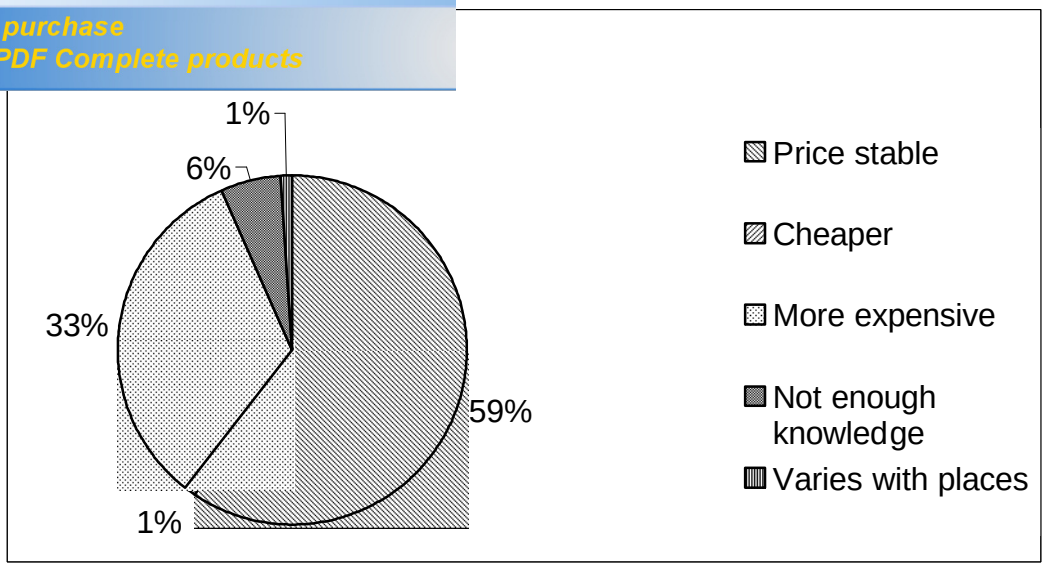

Figure 3.3: Perceptions of price changes of traditional medicinal plants over the past 10 years with inflation taken into account. A total of 89 individuals were interviewed**.**

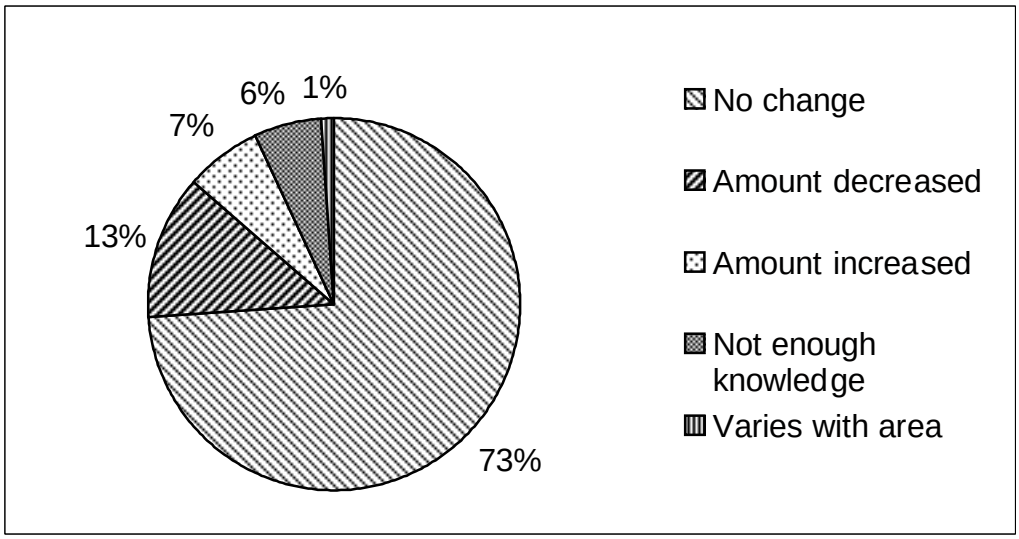

Figure 3.4: Perceptions of change in quantity of material traded over the past 10 years. Counts are out of a total of 89 individuals.

e study area

The national distributions of the target species are specified in section 3.5.2 above.

Of the Kimberley target species, the most widespread were Red onion (*Tulbaghia* species), Swartstorm (*Senna italica*) and White maisale or Klein swartstorm (*Thesium palidum*), which were present in seven of the 12 habitats studied (Table 3.2). Following this was a *Talinum* species, found in six of the 12 sites investigated. The habitat with the majority of the target species present was the *Acacia mellifera* woodland with eight species, followed by the *Tarconanthus* woodland with seven species. The investigation of species distribution in this particular study was limited to selected sites. Different results could potentially be obtained with a more detailed investigation in the Kimberley area.

3.5.5 Survival potential and sensitivity analysis

Species that represented the lowest survival potential and the highest sensitivity to disturbance were *Withania somnifera, Boophane disticha, Dicoma anomala* and *Bulbine natalensis* with the survival potential scores of 0.12, 0.18, 0.27 and 0.32 respectively (Table 3.2).

The average density of *Withania somnifera* across the selected sites was low at 0.01 (500 m^2) and the species were only found in two of the selected sites exposed to moderate disturbance. This coupled with the low growth response score of 2 suggests that the species is sensitive to harvesting and potentially vulnerable to high disturbance levels.

Boophane disticha was the next most sensitive species. Similar to *Withania somnifera*, this species had average low densities across all sites investigated and were only found in three of the sites exposed to moderate disturbance. Although *Dicoma anomala* gave one of the lowest survival potential scores and could be concluded to be a species sensitive to disturbance, the species indicated high growth response to disturbance. The low survival potential score is a direct result of the low average density of the species across the three

st and plant collectors concluded this to be a direct

Bulbine natalensis also indicated high sensitivity and vulnerability to disturbance. The species indicated low average densities across the two sites in which it occurred. Both sites were highly disturbed with a disturbance score of four, representing degraded environments, with high levels of harvesting and some level of recruitment. These factors coupled with the fact that the species have a low growth response to disturbance render them vulnerable and sensitive.

Some species reacted positively to disturbance and were more abundant in locations with higher disturbances. *Elephantorrhiza elephantina* was one such species. Three locations were compared; a commercial cattle-grazing farm exposed to intense grazing levels, government property along Transvaal road, Kimberley (road edge) and the Pniel communal area. Although private farms in the area (e.g. Pniel) are generally less degraded, this particular commercial farm was highly degraded from commercial farming with very little natural vegetation. Communal tenure systems generally suffer high resource exploitation from over-harvesting and grazing. The roadside was the most disturbed as a result of regular cuttings (roadside trimming to prevent overgrowth) as well as high runoff from the nearby road. The private farm situated next to the road was second in line with regard to disturbance, as a result of intensive livestock grazing. Percentage bare cover on the farm was a high of 30% coupled with a high grass cover of approximately 35%. Of the three sites, the Pniel communal land indicated the least disturbance. However, this site had the lowest densities of *Elephantorrhiza elephantina*. Figure 3.5 indicates a relationship between the density of *Elephantorrhiza elephantina* and increased levels of disturbance.

Observations were documented on the response of *Helichrysum* sp. to disturbance. This species showed the highest abundance in the most disturbed habitat studied, located in Galeshewe, which was highly disturbed and used as a dumping site. The density of plants was 20 pl/m^2 in Galeshewe communal area, compared to the Pniel game farm (*Acacia*

ndix 4). The species indicated a high growth response

kely not to be vulnerable to disturbance under the conditions presented in the study.

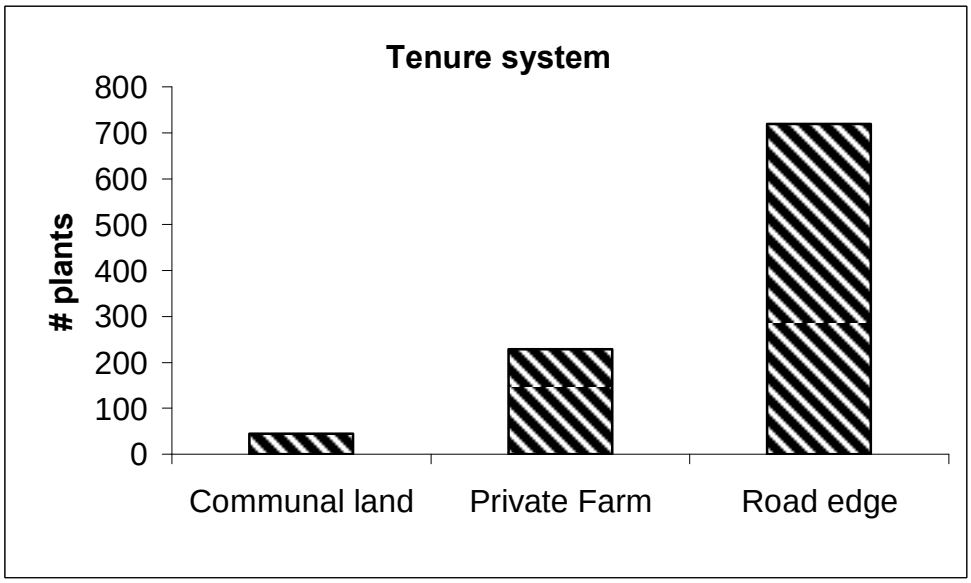

Figure 3.5: Abundance of *Elephantorrhiza elephantina* in various land tenure systems with increasing degrees of disturbance, with communal land being the least disturbed and the road edge being the most disturbed.

ed species to harvesting in selected sites. Refer to text for information on numerical codes for
se and survival potential. Density in plants/meter squared.

Scientific Name	Common Name	Density	Disturbance	Distribution	Growth Response	Survival Potential
Bulbine natalensis	Balsin	0.04	4	2	1	**0.32**
Talinum species	Punyuka	0.04	2	8	3	**1.2**
Thesium hystrix	White maisale/ Kleinswartstorm	0.15	3	7	2	**9.45**
Senna italica	Swartstorm	0.14	3	8	3	**10.8**
Lindneria clavata	White onion	0.03	3	4	3	**1.08**
Withania somnifera	Indian ginseng/Ubuvimba	0.01	3	2	2	**0.12**
Dicoma anomala	Mooimeisie	0.01	3	3	4	**0.27**
Tulbaghia species	Red Onion	0.24	2	3	4	**5.76**
Elephantorrhiza elephantina	Mosetsana	1.24	3	3	5	**55.50**
Harpagophytum procumbens	Devilõs Claw	0.04	3	3	3	**1.08**
Boophane disticha	Leshoma	0.01	3	3	2	**0.18**
Helichrysum odoratissimum	Mphepho	0.7	4	2	5	**28**

There are two levels to sustainability presented in this study. The first is sustainability at a local level presented by the harvesting of material locally and the second, sustainability at a much wider scale, represented by medicinal plant trade (i.e. plants collected from other provinces and surrounding countries). Investigations on the trade of medicinal plants provide good information for conservation and resource management. Species that are sold in market places are a ñshort list of a much wider range of species that are availableò (Cunningham 2001). Basically, market places and the sale of traditional plants reflect demand and supply parameters of traditional remedies. If demand for a particular plant material is high then the species will be sold in many market places. This particular herbalist traded a total of 79 traditional medicinal plants. Of the medicinal plants traded, two are specially protected and under significant threat of extinction. These included ñinyazangomaò, *Prunus africana* and the pepper bark tree *Warburgia salutaris*. *Warburgia salutaris* is limited to protected areas around the country and *Prunus africana* is listed in CITES Appendix 2 (Crouch et al. 2006). Other threatened species included *Ocotea bullata, Bersama lucens, Curtisia dentata* and a *Eugenia* species.

The majority of material traded was in the form of leaves and stems, followed by bulbs, roots and stems. Leaf harvesting in most species is not as detrimental as the harvesting of bark or root material, however the excessive collection of these plant materials could affect the reproductive outputs and population dynamics of species. The harvesting of bark material is often the most destructive to plant communities as ring-barking generally takes place, stopping the conduction of water and nutrients throughout the plant. Roots serve an important function in plants by serving as an anchor and absorbing water and nutrients, often roots are unsustainably harvesting resulting in the death of the whole plant.

Although most of the material traded was not collected locally, it represented harvesting in other parts of the country. It is of importance that the trading of such material locally be linked to the harvesting of these wild natural resources in other parts of the country and conservation measures put in place at a much wider scale (geographically).

mberley) were in the form of rhizomes and bulbs. In prooted and taken for medicinal use, suggesting that these destructive harvesting techniques might ultimately impact the sustainable harvesting and population dynamics of these species. Although re-sprouters and bulbs can recover from stem damage and the damage of underground storage organs, they tend to be poor colonisers if over-utilised and over-exploited. As a result, populations can decline over time (Cunningham 2001).

A reflection of the decline in plant populations over time is indicated by the increase in travelling distance to collection sites. The Rastafarian herbalist proclaimed distances to collecting sites in the area to be increasing over time as species become scarcer. This was however, not reflected by the changes in price and quantity of material traded over the past century. The majority of individuals proclaimed the price and quantity of material traded to have remained stable with time. Stability in price could be related to the fact that most of the material traded locally is still readily available. Although communities have declined with time (increased travelling distances), the natural resources have not reached scarcity levels high enough to have significant effects on price ranges. In addition, plant traders in the area are limited in dictating prices of local species, as they are readily available. Prices that are set too high could drive consumers to harvest from the wild instead of purchasing material. Although readily available material at the market tends to be cheap, imported material such as *Ocotea bullata* (bark material) is generally significantly more expensive and sold in small quantities. The herbalist travels outside Kimberley on average twice a year for the collection and such material, thus the material needs to last until such times.

Target species were investigated and tested for vulnerability or sensitivity to disturbance. Species that represented the lowest survival potential and the highest sensitivity to disturbance were *Withania somnifera, Boophane disticha, Dicoma anomala* and *Bulbine natalensis.* Most of these species indicated low densities across the selected sites. The herbalist associated these low densities to the low rainfall season experience during that season (2004). *Withania somnifera* is classified as a weed of disturbed areas, indicating its general tolerance to high disturbance. However, in this particular study the species did

turbance. Although these four species indicated high end to be widely distributed in South Africa.

Certain species responded positively to disturbance. *Elephantorrhiza elephantina* was one such species. Of the tenure systems investigated the species was most abundant in the highly disturbed roadside, exposed to annual cuttings and an increased run off. A *Helichrysum* sp. was another example and was most abundant in the most disturbed tenure system investigated (used as a dumpsite and thoroughfare). In both cases, the increased abundance and densities of species could be linked to water availably as a result of increased runoff in the degraded sites.

Rainfall plays a vital role in the population dynamics of savanna species and could possibly have had a major influence on the results presented by the study. A more detailed investigation considering seasonality would have to be conducted. Also equally important is the investigation of tenure systems in the area. Apart from the exploitation of medicinal plants and loss of diversity to harvesting, land use practices employed in the area also play a significant role in plant depletion. Communal areas are highly degraded from over-grazing, mainly associated with free access and ownership of land and commercial farms degraded to over-stocking and over-grazing. These factors are part of economic and political issues not investigated in this study.

To minimise destructive harvesting in the area and to ensure the sustainability of these natural resources, it is important that harvesters be educated on proper harvesting techniques. For example, this might involve leaving certain plant material behind to allow remaining plants to thrive. The Rastafarian herbalist, for example, only harvested certain rhizomes of the *Elephantorrhiza elephantina* and left enough material for the plant to survive. Other factors such as seasonality of harvesting, intensity of harvesting and frequency of harvesting need to be implemented and monitored, however, these are mainly related to the life histories of plants species and will differ per species. Most of these practices are however, difficult to implement, especially in communal areas, with free access to entry where traditional systems of control and access rights are not in place. Tenure systems play a major role in the sustainability and conservation of traditional medicinal wild stocks in the area and should be investigated in more detail.

Arnold T., Prentice C., Hawker L., Snyman E., Tomalin M., Crouch N and Pottas-Bircher C. 2002. Medicinal and magical plants of South Africa: An annotated checklist. National Botanical Institute. Pretoria.

Britz M.L. 2004. The effects of soil type and management strategy on vegetation structure and function in a semi-arid savanna, South Africa. PhD Thesis. University of Stellenbosch.

Crouch N., Symmonds R., Spring W. and Diederichs N. 2006. Fact sheet for popular medicinal plants. In Diederichs N. (Ed.). Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Cunningham A. 1998. Working paper, pp 1-12, WWF/UNESCO/KEW People and Plants Initiative. Paris, France: UNESCO.

Cunningham A. 2001. Applied ethnobotany: People, wild plant use and conservation. Earthscan publications. UK.

Cunningham A. and Mbenkum F. 1993. Sustainability of harvesting *Prunus africana* bark in Cameroon: a medicinal plant in international trade. People and Plants working paper 2, INESCO, Paris.

Cunningham M., Cunningham A. and Schippmann U.1997. Trade in *Prunus africana* and the implementation of CITES. German federal agency for nature conservation. Bonn, Germany.

Diederichs N. 2006. Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Geldenhys C. and Mitchell D. 2006. Sustainable harvesting technologies. In Diederichs

l plants: A South African guide. Sun press.

Holling C.S. 1973. Resilience and stability of ecological systems. *Annu. Rev. Ecol. Syst.* 4:1ï 23.

Hutchings. A. 1996. Zulu medicinal plants: An inventory. University of Natal Press, Pietermaritzburg.

Koenen E. 1996. Medicinal poisonous and edible plants in Namibia. Klaus Hess publishers. Windhoek, Namibia.

Lambert J., Srivastava J. and Vietmeyer N.1997. Medicinal plants: Rescuing a global heritage. The World Bank Washington, DC.

Mander M. and Brenton G. 2006. Overview of the medicinal plants industry in South Africa. In Diederichs N. (ed.) Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Mander M. 1998. The marketing of indigenous medicinal plants in South Africa: A case study in KwaZulu Natal. Food and agricultural organization of the United States. Rome.

Maze K. and Bond W. 1996. Are *Protea* populations seeds limited? Implications for wild harvesting in Cape Fynbos. *Australian Journal of Ecology* 21: 96-105.

Pei S. 2002. Ethnobotany and modernisation of traditional Chinese medicine. Paper at a workshop on wise practices and experimental learning in the conservation and management of Himalayan medicinal plants. Kathmandu, Nepal. [Online] 14 April 2005. The WWF Nepal Program, MMAPPA and PPI.

Cunningham A. 2001. Impact of cultivation and ...diversity. Global trends and issues. Inter-Department Working Group on Biology for Food and Agriculture, FAO, Rome, Italy.

Subrat N. 2002. Ayurvedic and herbal products industry: Paper at a workshop of wise practices and experimental learning in the conservation and management of Himalayan medicinal plants. Kathmunda, Nepal. [Online] 14 April 2005. The WWF Nepal Program, MMAPPA and PPI.

Williams V., Balkwill K. and Witkowski E. 2000. Unravelling the commercial market for medicinal plants and plant parts on the Witwatersrand, South Africa. *Biodiversity and Conservation 14*: 2971-3001.

van Wyk B and Wink. M 2004. Medicinal plants of the world. Briza publications. Pretoria, South Africa.

van Wyk B. and Gericke N. 2000. People's plants: a guide to useful plants of South Africa. Briza publications. Pretoria, South Africa.

van Wyk B., Oudtshoorn B. and Gericke N. 1997. Medicinal plants of South Africa. Briza publications. Pretoria, South Africa.

Zhao C. and Shao G. 2002. Logging restrictions in China: A turning point of forest sustainability. *Journal of Forestry* 100: 34-37.

Zschocke S., Rabe T., Taylor J., Jäger A. and van Staden J. 2000. Plant part substitution - a way to conserve endangered medicinal plants? *Journal of Ethnobotany* 71: 281-292.

Zschocke S., Drewes S., Bauer R. and Staden J. 2000. Analytical and pharmacological investigation of *Ocotea bullata* (black stinkwood) bark and leaves. *Journal of Ethnopharmacology* 71:219-230.

CHAPTER FOUR

UNCERTAINTIES, LIMITATIONS AND SHORTCOMINGS

4.1 Abstract

This chapter deals with the challenges, limitations and uncertainties encountered during the course of the research study. Uncertainties presented were mainly linked to the research methodology used as well as confidence in the data i.e. a part of the study is social and information documented based on individual knowledge, experiences and perceptions. Time constraint was a major limiting factor in the study, limiting the level of detail at which research could be carried out. Due to time constraints, sampling was limited to selected target areas and did not cover the whole Kimberley area. This study is an overview of the social and ecological principles of sustainability and does not focus on economics and political principles, although referred to.

4.2 Introduction

This research study is a first record of plant use by urban Setswana-speaking people. Over 70 traditional medicinal plant remedies are used by the community, some of which are imported from surrounding local areas as well as immediate surrounding countries. The study is also a first attempt to document medicinal plant use in the Kimberley area, Northern Cape of South Africa

Consumers represented all age groups but were predominantly adults between the ages of 20 and 35 and older than 35. The majority were generally uneducated with some level of secondary schooling. Although most of the individuals fell within the low-income bracket, they do not classify as poor as they were employed. Many individuals in the area continue to rely on traditional remedies as part of culture and tradition, and not

unds, although such medication is generally cheaper This indigenous knowledge of traditional plants is embedded in Setswana culture, as part of the tradition as is past on from generation to generation internally (within families) or externally (from surrounding neighbours through word of mouth).

Past and recent migrations in the area coupled with urbanization are the main contributors to cultural changes as they bring about the contact and exposure of specific cultures to other diverse cultures. This results in the amalgamation of various cultures. It appears cultural practices and traditions in Kimberley have amalgamated resulting in more diverse and complex cultures. This can be quantified by the number of people with Setswana origins who in fact speak Afrikaans as a first language. In addition, many of the species traded and used locally were commonly used in other areas of South Africa. For example, there have been increasing overlaps in medicinal plant use between different provinces within the country. For example, of the traditional medicinal plants used in the Eastern Cape Province of South Africa (Dold and Cocks 1998), 30% were also used in Kimberley. Also of the 10 most commonly traded species in Gauteng (Williams et al. 2000), half were commonly traded in Kimberley. This represents a wide distribution of uses and homogeneity.

The study investigated sustainability at two levels, nationally (through the investigation of market trade) and locally (through the investigation of local harvesting). Because local markets represent a ñshort listò to a much wider range of species, assessments of these markets are important in ethno botanical surveys as they present information on what is being traded as well as the depletion and scarcity these commodities. This provides rapid assessments that include species from wider geographical areas (Cunningham 2001). Of the medicinal plants traded, six species had become threatened from over-harvesting and were limited to protected areas around the country. The harvesting of traditional medicinal plants in the area is currently not a major threat of species diversity in Kimberley, i.e. most species harvested were widespread, readily available and in some cases weeds to disturbed areas. However, certain species indicated sensitivity to disturbance and had low survival potentials rendering them vulnerable to over-

their underground storage organs removed and often

4.3 Uncertainties presented by the study

4.3.1 Social studies

Phase one of the study used a questionnaire, participatory observation and botanical species identification and phase two of the study is scientific (can be proven using scientific theory) and entails a scientific investigation of selected locally harvested species and their habitats to determine long-term sustainability.

Phase one of the study is community-based and entails participatory rural appraisals with the local communities. The author is not trained in social studies, thus knowledge of participatory appraisals was primarily from existing literature (Cunningham 2001) as well as past experiences in other community-based projects. This part of the study, like many social studies places a strong reliance on an individualôs perceptions. It places confidence on information obtained from the street vendor as well as interviewed personnel purchasing traditional medicinal plants. All information on the traditional medicinal plants, including the use of the plants, methods of administering, plant parts used and reasons for use was obtained from a street vendor and interested customers. The understanding of the use of traditional medicinal plants from such indigenous sources (street vendor and personnel interviewed) is the essence of this thesis, i.e. the sole purpose of the study is to investigate the use of traditional medicinal plants by the Setswana-speaking community in Kimberley. The first level of uncertainty associated with the study could be linked to the credibility of information delivered by the street vendor as well as personnel interviewed, i.e. participatory rural appraisals present some level of uncertainty linked to the credibility of information delivered.

The herbalist provided the local names of the species traded and harvested. Using local names, existing literature was used for species identification (Arnold et al. 2002, Ben-Eric van Wyk and Wink 2004, Cunningham 2001, Diederichs 2006, Hutchings 1996, Koenen 1996, van Wyk et al. 1997, van Wyk and Gericke 2000). Confidence is placed in these sources and misidentification at that level would result is the misidentification of species in this study.

4.4 Limitations presented by the study

Given the time constraints presented by this masterôs thesis, detailed investigations were only limited to selected habitats and did not cover the Kimberley area as a whole. Fieldwork as well as participatory rural observations was both limited to a space of two weeks.

4.4.1 Time constraints

Fieldwork was limited to a period of two weeks, presenting a major limitation to this research study. As a result, only one season (after rainy season) was investigated. More detailed investigations on herbal species diversity, abundance and distribution in the area, would have to be conducted across all spectrums of seasonality. Seasonality has major implications on this study as plant population dynamics (especially in the savanna biome) change with external factors such as climate, water availability, heat and dryness.

Given the time constraints of the thesis, only one herbalist was used for information gathering. Kimberley being a smaller city compared to city giants such as Johannesburg and Durban only comprised two herbalists and one *muthi* shop. The herbalist chosen for the scope of the study was positioned in the city centre and exposed to the greater dynamism of the city life. The other herbalist was situated on the outskirts of the city and exposed to fewer and less divers individuals. This study primarily focuses on the poorer

f plants at street vendor level was preferred to trade at
os are often perceived to be more expensive than local street vendors. There is also the general perception that medicinal remedies from street vendors are freshly picked and not accumulated over longer periods of time as in *muthi* shops. *Muthi* shops tend to keep bulk material, often over longer periods to create more stable markets (i.e. material is always available).

4.4.2 Site selection

Five of the sites visited were selected by the collectors with target species in mind; these were the areas where the species were most abundant and the target areas for collection. However, other medicinal plants falling within the selected areas were also included in the study and species counts taken. The remaining eight sites investigated in the study were selected within different habitats and tenure systems (private farms and communal) within Kimberley. Thus, only specific sites were investigated based on the collectorôs knowledge of the environments and hotspots for harvesting, as well as the random section of habitats within savanna biomes. Investigations were limited to these selected sites and did not cover the whole Kimberley area. This is the main limitation to the study, as species distributions, densities and diversity vary with location and sample size. Wider study areas are better representations of plant communities and plant dynamics. The selection of sites has major implications on any research studies conducted. Factors such as distance to residential areas and communal lands also play a role in results obtained. More detailed studies researching on medicinal species diversity within the wider Kimberley area would have to be undertaken.

4.4.3 Investigation of other significant factors influencing sustainability

It must be emphasised that not all the principles of sustainability were investigated in this particular study. This study touches on certain aspects of ecological and social parameters; however, detailed investigations were not conducted on all spheres of these parameters. Ecology is a complex doctrine comprising diverse fields and research categories. Other factors such as reproductive biology, bush encroachment, habitat loss,

are beyond the scope of this study and too broad to be
owever, this allows for cross-referencing between
various studies and research fields.

The economic and political principles of sustainability were not investigated as part of this study although referred to as justification for various arguments. Sustainability is a complex concept with many of its parameters inter-linked; it is thus difficult to draw conclusions on the sustainability of species, without taking all aspects of sustainability into consideration. Conclusions in this study, like many other research studies are based on studies conducted and parameters explored.

4.5 Short Comings

The main shortcoming presented by this particular study was that of time constraints. The study was conducted as part of a one-year Masters thesis, of which the thesis component was limited to a period of six months. Thus, the actual fieldwork was restricted to a total of four weeks. This study provides an overview of resource use, trade, harvesting practices and sustainability issues in Kimberley, detailed analysis of actual species compositions, distribution and harvesting across the whole Kimberley area and over longer periods (including all seasons) would have to be undertaken.

4.6 Recommendations

4.6.1 Policy and Institutional Support

The national and local governments support for traditional medicinal plant trade is extremely limited (Mander 1999). In the past, the national department of Agriculture, Health, Trade and Industry as well as the Department of Environmental Affairs and Tourism did very little to support the countryôs medicinal plant trade (Mander 1999). Although several local, provincial, national and international regulatory and control mechanisms are currently in place, influencing the marketing and trading of medicinal

than supports the marketing of plants (Mander 1999)

Initiatives for promoting the marketing and trade of traditional medicinal plants in the country have to be officially developed. However, this is highly unlikely, as most departments would probably not support a change in the allocation of resources, especially when traditional medicinal plant trade falls within the informal sector and presents serious challenges with regards to resource management and sustainability.

A more integrated approach between the different tiers of government, businesses and current market players has to be undertaken. The government has to recognize the potential for the industry in economic development, and aim to promote biodiversity conservation within the industry. Although policies and legal frameworks are currently in place, proper implementation processes have to be investigated to ensure efficiency in managing biodiversity and ensuring the conservation of threatened species. The potential role of the government within the industry is fundamental in promoting the management of wild stocks, supporting biodiversity conservation and the promotion of cultivation practices especially of slow growing species.

4.6.2 Skills, literacy and increased awareness

The sector of traditional medicinal plant trade has major skills limitations (Mander 1999). Many plant collectors and informal traders have low literacy levels and come from impoverished backgrounds (Cunningham 2001). For the majority of traders, trading of traditional medicinal plants is not a profession of choice; but many are presented with no hope of securing jobs in the South African job market. Through trade of medicinal plants, such individuals are able to sustain families and households.

Although traditional healers and herbalists might have indigenous knowledge of the plants and the environment, the industry is currently saturated with commercial street vendors that trade solely as a means of survival. For many such individuals sustainability is a foreign and far-fetched concept when their own survival is at risk. Most traders have

iness and have limited understanding of business vide range of opportunities presented by the market (Mander 1998).

Government-funded initiatives should be implemented for skills development within the industry as well as increased awareness within and outside the industry. However, such functions should not be limited to governments but also include other organizations and institutes such as the NRF, CSIR, medicinal plant institutes and well as botanical and conservation bodies.

4.6.3 Plant Cultivation

Cultivation of scarce traditional medicinal plants was suggested more than 50 years ago (Gerster 1938). Although the cultivation of popular slow-growing medicinal plants is essential outside core conservation areas within the country (Cunningham 1998), many challenges face such initiatives. Limitations include the fact that most of the species requiring conservation and cultivation are slow-growing species and take years to reach maturity or stages that allow harvesting. The slow-growth rates of such species and lack of institutional support (Cunningham 1998) coupled with the low prices paid for traditional medicines, renders many such initiatives non-profitable (Wynberg 2002).

Thus, if cultivation were to be profitable, it would be restricted to a few highly priced fast -growing plant species. Supply of large quantities of cultivated material could also potentially negatively influence the livelihoods of relatively smaller wild collectors (Steward and Cole 2005). It is also unlikely that rural harvesters would be able to finance commercial ventures due to the unavailability of capital, technology, and in some cases land.

For cultivation to be successful, it would require strong institutional support and the integration of conversationalists and traditional medicinal practitioners (Gipson and Becker 2000). Herbalists and traditional medicinal plant traders have the knowledge of the distribution of plants and are aware of areas that have been over-harvested and require

Their insights, coupled with botanical knowledge, sustainability of popular traditional medicinal plants.

4.6.4 Plant part substitution

Studies by Zschocke et al. (2000) indicated that the potential for plant part substitution (use of alternative plant parts within the same plant) is highly plant specific. Plant part substitution was investigated in four species, all effective in the treatment of bacterial-induced ailments. Species investigated included: *Eucomis autumnalis* (bulb), *Siphonochilus aethiopicus* (rhizome), *Ocotea bullata* (bark) and *Warburgia salutaris* (bark). Inhibitory activity was found in all plant part extracts. For *Eucomis autumnalis;* the stem and leave extracts of *Siphonochilus aethiopicus* exhibited higher inhibitory activity than the commonly used underground parts and the bark and leaves of *Ocotea bullata* and *Warburgia salutaris* were equally active. Plant part substitution presents alternatives to the harvesting of certain plant parts. Plant part selection plays a critical role when harvesting and could determine the survival or death of various plants. Where ring barking is a problem, leaves and stems could alternatively be used. More studies need to be conducted on plant part substitution and such information promoted to traditional plant harvesters.

4.7 Conclusion

For the concept of sustainable harvesting to come into full implementation, many of the challenges currently facing traditional medicinal plant trade would have to be addressed. Increased awareness and skills development of traditional medicinal practitioners as well as many of the commercial plant collectors will have to be promoted. Awareness and training should include basic education on plant dynamics, sustainable harvesting practices, business and resource management as well as the introduction of new concepts such as large-scale cultivation and the processing of raw material.

There are a number of possible strategies to solve the issue of sustainability (Cunningham 1991). One would be the efficient implementation of existing policy and legal framework

diversity of natural resources; another would be large
able in the short term especially for slow-growing species, (Zschocke et al. 2000) and thirdly the use of alternative plant parts (Cunningham 1988).

The implementation of cultivation; both small- and large scale, will go a long way to alleviating pressures from wild stocks. This, coupled with more government intervention and effective implementation of legislation at local, provincial and national level, will help implement the sustainable use of traditional medicinal plants (Mander 1999). However, many such initiatives can be rendered useless without effective education and increased awareness from local gatherers. Only when harvesters start understanding plant dynamics associated with the different species dealt with on a day-to-day basis, can a more effective conservation plan be put into place. Until the challenges facing the traditional medicinal industry are addressed, South Africaôs traditional medicinal plants will continue to be threatened and many such plants could face extinction if not prioritised.

4.7 References

Arnold T., Prentice C., Hawker L., Snyman E., Tomalin M., Crouch N. and Pottas-Bircher C. 2002. Medicinal and magical plants of South Africa: An annotated checklist. National Botanical Institute. Pretoria.

Cunningham A. 1998. Working paper, pp 1-12, WWF/UNESCO/KEW People and Plants Initiative. Paris, France: UNESCO.

Cunningham A. 1991. Development of a conservation policy on commercially exploited medicinal plants: A case study from Southern Africa. Conservation of medicinal plants. UK. Cambridge University Press. pp 337-358.

Cunningham A. 2001. Applied ethnobotany: People, wild plant use and conservation.

Diederichs N. 2006. Commercialising medicinal plants: A South African guide. Sun press. Stellenbosch.

Dold A. and Cocks M.1998. The trade in medicinal plants in the Eastern Cape Province, South Africa. *South African Journal of Science*: 98: 589-597.

Gerstner J. 1938. A preliminary checklist of Zulu names of plants. *Bantu Studies* 12: 215-236.

Gibson C. and Beker C. 2000. A lack of institutional demand: why a strong local community is western education fails to protects its forest. In: Gibson C, Mc Kean M and Ostrom E. People and Forests: Communities, Institutions and Governance. MIT Press, Cambridge pp 135-162.

Hutchings A. 1996. Zulu medicinal plants: An Inventory. University of Natal Press. Pietermaritzburg.

Mander M. 1999. The marketing of indigenous medicinal plants in South Africa: A case study in KwaZulu Natal. Food and agricultural organization of the United States.

Steward K. and Cole D. 2005. The commercial harvest of Devilôs Claw (*Harpagophytum* sp.) in Southern Africa: The devilôs in the details. *Journal of Ethnopharmacology* 100: 225-236.

van Wyk B. and Gericke N. 2000. Peopleôs plants: A guide to useful plants of South Africa. Briza publications. South Africa, Pretoria.

van Wyk B. and Wink N. 2004. Medicinal plants of the world. Briza publications. South Africa, Pretoria.

Gericke N. 1997. Medicinal plants of South Africa. Africa.

Wynberg R. 2002. Devilôs Claw: from African traditional remedy to modern analgesic and anti-inflammatory. *HerbalGram* 50:47-54.

Zschocke S. and van Staden J. 2000. *Cryptocarya* species-substitute plants for *Ocotea bullata?* A pharmacological investigation in terms of cyclooxygenase-1 and -2 inhibition. *Journal of Ethonopharmacology* 71: 473-478.

APPENDIX I

QUESTIONNA IRE

Charlotte Monakisi
Masters Ecological assessment
University of Stellenbosch
Botany department

Date of interview:

BUYER

1. Gender [M] [F]
2. Age group [<10] [10-20] [20-35] [>35]
3. Level of education [Primary] [Secondary] [Tertiary]
4. Upbringing [Rural] [Urban]
5. Marital Status [Single] [Married] [Divorced] [Widowed]
6. Religion [Ancestors] [Christian] [Both] Or [Other]
7. If other Specify

   _____
8. Occupation

[Farmer] [Housewife] [Civil servant] [Self ï employed] [Private sector employee] [Other]

9. If other specify

_____

10. Cultural Group [San] [Tswana] [Coloured] [Other]

11. What plants do you use for Medicinal purposes?

_____

12. What do you use them for?

Plants Used For Medicinal Purposes	Benefit/Use

13. Why not the Chemist?

_____

14. Why donôt you collect them yourself?

_____

16. How did you come to know about it? [Culture] [Friend] [People]
17. Do you only buy from this man and why?

18. If you donôt find a particular plant here, do you go else where to find it? Or any substitute serving the same purpose will do?

19. How do local medicinal plants compare to ones elsewhere in the country and outside the country?

Sustainability

20. Has the price changed over the years? [Yes] [No]
21. How? [More] [Same] [Less]
22. Has the amount of sample changed over the years? [Yes] [No]
23. How? [More] [Same] [Less]

RASTAR (questions for the Rastafarian herbalist)

24. Name:

25. Number of years selling

_____

26 Is there a middleman? [Yes] [No]

26. Has supply changed over the years? [Yes] [No]

27. Why?

_____

28. Has demand changed over the years? [Yes] [No]

29. Why?

_____

COLLECTOR

Collection

30. Seasonality of plant collection

_____

31. How often do you harvest?

_____

32. Which parts of the plant do you harvest? [Bulbs] [Roots] [Shoots] [Stem] [Roots]

33. Are local plants better than ones elsewhere in the country and outside the country? [Yes] [No]

34. Why?

_____

Sustainability

35. Is there competition with other collectors? [Yes] [No]

36. What type of competition?

_____

37. Do you feel there is any ownership of resources?

_____

38. Has the range in medicinal plant availability changed with time? [Yes] [No]

39. How?

_____

40. Do you harvest more or less compared to previous years? [More] [Less]

41. Has the pricing changed with time? [Yes] [No]

42. Why?

43. Have amounts changed over the years?

_____

44. How?

_____

45. Has supply changed over the years? [Yes] [No]

46. Why?

_____

47. Has demand changed over the years? [Yes] [No]

48. Why?

_____

APPENDIX II

TRADITIONAL MEDICINAL PLANTS TRADED BY THE STREET VENDOR

Scientific name: *Acacia xanthophloea*
Common Name: Makhanyakude
Plant Use: Sliced and boiled, drunk to clear dreams and visions
Ground to powder form and sprinkled with water to strengthen business
Ground into powder, and applied to skin, good for skin
Used on skins and hides, for preservation and hardening
Sliced and boiled, drank to control heartbeats and used to strengthen weak hearts
Plant Part: Bark

Scientific name: *Acorus calamus*
Common Name: Ikalamuzi
Plant Use: Ground to powder form and boiled, drunk to relieve all kind of problems
Ground to powder form and boiled, given to babies to drink to reduce high temperatures
Ground to powder form and sniffed, aids in mental problems
Ground to powder and boiled, drunk as a laxative
Plant Part: Stem

Scientific name: *Albizia adianthifolia*
Common Name: Ngandangkau
Plant Use: Ground to powder form and sniffed to cure mental disorders and alleviate mental retardation

wder form and sprinkled in the yard to remove evil

	Ground to powder form and used for hides and animal skins
Plant Part:	Bark
Scientific name:	*Alepidea amtymbica*
Common Name:	Lesoko
Plant Use	Ground to powder form and eaten for ulcers
	Ground to powder form, mixed with marijuana and smoked
	Sliced and boiled, extract drunk to cure tuberculosis and pneumonia
Plant Part	Rhizome
Scientific name:	*Aloe maculata*
Common Name:	Icena
Plant Use:	Ground to powder form and sniffed to relieve migraines and headaches
	Ground to powder form and sniffed to alleviate of stress
	Ground to powder form and sniffed to cure mental disorders, good for the central nervous system
Plant Part:	Stems
Scientific name:	*Artemisia afra*
Common Name:	Lengana/umhlonyane
Plant use:	Sliced and boiled, extract drunk to cure colds (drink)
	Sliced and boiled, water used in vomiting rituals to get rid of slime accumulated in the digestive tracts
	Mixed with rosemary, good for hair growth
Plant Part:	Leaves/stem
Scientific name:	*Balanites maughamii*
Common Name:	Umgobanhlovu

ed with to strengthen the body, good as vitamins

wder form, used for luck (bathed with)

Extract steam with or boiled and drunk, good for muscles

Plant Part: Bark

Scientific name: *Berchemia discolor*

Common Name: Vuka

Plant Use: Ground to powder form and sprinkled on company merchandise, to keep the customers flowing in

Mixed with other herbs and milk, good for increasing sperm counts and physical fitness

Plant Part: Bark

Scientific name: *Berkheya onopordifolia*

Common Name: Mohato

Plant Use: Burnt and ashes mixed with baby jelly, to ease itchiness and cure skin rash

Sliced and boiled, extract drunk to cure kaffir poison (poisoning using *muthi*)

Sliced and boiled, good for skin repair, thus useful after surgery (drink)

(Poisonous when taken in high doses)

Plant Part: Stems/leaves

Scientific name: *Bersama lucens*

Common Name: Isindiyandiya

Plant use: Ground to powder and boiled, drunk to cure tuberculosis

Ground to powder and boiled, drunk to cure meningitis

Ground to powder and boiled, drunk to cure sexually transmitted diseases

Ground to powder and boiled, drunk, good for HIV patients, boosts immunity

Scientific name:	*Boophane disticha*
Common Name:	Leshomelo
Plant use:	Sliced and boiled, extract used for sours, cuts and surgical wounds (drink)
	Leaves used to prevent over-bleeding
Plant Part:	Bulb/leaves

Scientific name:	*Bowiea volubilis*
Common Name:	Igibisila
Plant use:	Sliced and boiled, drunk, used as a laxative
	Sliced and boiled, water used as an enema
	Sliced and boiled, given to kids to get rid of tape worms and slime
Plant Part:	Bulb

Scientific name:	*Bulbine natalensis*
Common Name:	Rumo la madi/Rooiwater
Plant use:	Roots boiled and the extract orally taken for blood purification and the treatment of various ailments such as diabetes and urinary problems
Plant Part:	Roots

Scientific name:	*Chironia baccifera*
Common Name:	Bitterbos
Plant use:	Used as tea
	Boil and extracted drunk to relieve indigestion
	Used as a laxative
Plant Part:	Stems/ leaves

Scientific name:	*Clivia miniata*

wder form and mixed with water, bathed with to remove evil spirits (roots)
Crushed and boiled, extract drunk to cure diabetes (roots)
Good for joints and building muscles (roots)
Stem used as a snake repellent

Plant Part: Roots /stem

Scientific name: *Curtisia dentata*
Common Name: Umlahleni
Plant use: Ground to powder form, mixed with water and used to cure Diabetes
Ground to powder form, mixed with water and used in curing hypertension and high blood pressure
Eaten as powder to relieve indigestion
Powder eaten to cure kaffir poison and also
Bathed with before a court case for luck and things to go in your favour.
Plant Part: Bark

Scientific name: *Dicoma anomala*
Common Name: Thlwenya
Plant use: Sliced and boiled, extract good for colds
Ground to powder form and boiled, extract drunk to cure kidney problems
Ground to powder form and boiled, drunk, good for bladder problems
Ground to powder form and boiled, extract good in curing womb problems
Used as an enema, to cure prostate and genital problems also strengthens sperm and increases sperm counts
Plant Part: Bulb

Scientific name:	*Dioscorea sylvatica*
Common Name:	Skilpad
Plant use:	Boiled and extract drunk to strengthen muscles
	Ground to powder form and used for protection against witchcraft (drink with water)
	Boil and extract drunk, cures strokes and heart problems
	(Poisonous if taken in high doses)
Plant Part:	Rhizome

Scientific name:	*Dodonaea angustifolia*
Common Name:	Eesterhout
Plant use:	Sliced and boiled, extract drunk in cases of ion deficiency. Rich in ions
	Sliced and boiled, extract drunk, good source of vitamin C (drink)
	Sliced and boiled, extract drunk, good for joints, bones and arthritis (drink)
	Sliced and boiled, to strengthen babies (drunk)
Plant Part:	Leaves and stems

Scientific name:	*Drimia robusta*
Common Name:	Skanama
Plant use:	Sliced and boiled, water used for diabetes, high blood pressure
	Sliced and boiled or taken in powder form for kaffir poison
	Planted in the yard to remove evil spirits
	Mixed with gentian violet to abort a foetus.
Plant Part:	Bulb

Scientific name:	*Elaeodendron transvaalensis (Dolichos falciformis Dold* and Cocks*)*
Common Name:	Ingwavuma
Plant use	Ground to powder form and boiled, drunk to relieve hypertension
	Ground to powder form and boiled, drunk to relieve gout
	Ground to powder form and boiled, drunk to relieve inflammation of organs
	Sliced and boiled, drunk to enhance erections
	Sliced and boiled, drunk for slimming purposes
Plant Part	Bark

Scientific name:	*Elephantorrhiza elephantina*
Common Name:	Mosetsana
Plant use:	Sliced and boiled, extract drunk as a blood purifier
	Sliced and boiled, extract drunk to heal and clean kidney and clear the air canal
	Gurgle with to cure tonsillitis
	Extract steamed with to relieve itchiness
	Mixed with other herbs to reduce high blood pressure
	Used as for vomiting rituals.
Plant Part:	Root

Scientific name:	*Elytropappus rhinocerotis*
Common Name:	Renosterbos
Plant use:	Burnt to remove evil vibrations
Plant Part:	Leaves/stem

Scientific name:	*Eriocephalus africanus*
Common Name:	Wild rosemary
Plant use:	Sliced and boiled, extract drunk to cure mental instabilities

iled, stimulates hair growth (wash hair with)

Scientific name:	*Eriocephalus punctulatus*
Common Name:	Sehalahala sa matlape
Plant use:	Boiled and extract drunk to reduce high blood pressure
	Boiled and extract drunk to cure sugar diabetes
	Boiled and extract drunk to cure STDs (also taken as an enema)
	(Poisonous when taken in high doses)
Plant Part:	Leaves/stems

Scientific name:	*Erythrina lysistemon*
Common Name:	Lucky beans
Plant use:	Chewed, acts as laxative and brings luck
	Placed under the tongue for luck when gambling
	Carried around, acts a lucky charm and helps with promotions at work
	Seeds given to poultry to increase their reproductive output
	Leaves placed in graveyards, good for communicating with ancestors
Plant Part:	Seeds/leaves

Scientific name:	*Eucalyptus sp.*
Common Name:	Eucalyptus
Plant use:	Boiled and extracted drunk to relieve colds
	Sliced and boiled, extracted water used in vomiting rituals
	Steamed with, for clearing skin
Plant Part:	Leaves/stem

Scientific name:	*Eucomis autumnalis*
Common Name:	Umathunga/ Mpukanele
Plant use:	Sliced and boiled, to heal surgical wounds (drink)
	Sliced and boiled, good for bones (drink);
	Sliced and boiled, good source of vitamin C (drink);

	ıema to relieve indigestion;
	ıema to cure sexually transmitted diseases
	(Poisonous when taken in high doses);
	Ground to powder form and sprinkled to attract people. Makes a person more attractive to the opposite sex;
	Used for cleansing during ancestral feast, mixed with the blood of the slaughtered animal
Plant Part:	Bulb/Seeds
Scientific name:	*Harpagophytum procumbens*
Common Name:	Devilôs claw
Plant Use:	Ground to powder form, good for all kinds of diseases
	Sliced and boiled, cures womb cancer and rebuilds the womb (drunk)
	Mixed with soft porridge and eaten, good source of vitamins
Plant Part:	Root
Scientific name:	*Helichrysum odoratissimum*
Common Name:	Mpepho
Plant Use:	Burnt to remove evil spirits and restore peace in the mind
	Burnt and smoke inhaled, soothes chest pains.
	Ashes sprinkled in the yard to remove evil spirits and for protection
Plant Part:	Leaves and shoots
Scientific name:	*Helichrysum sp.*
Common Name:	Sangume
Plant Use:	Ground to powder form and sprinkled to get rid of evil vibrations
	Sliced and boiled, drunk for all kinds of body pains and diseases.
	Sliced and boiled, common remedy for diabetes and high blood pressure
Plant Part:	Root

Scientific name:	*Hermannia depressa*
Common Name:	Phate ya ngaka
Plant Use	Sliced and boiled, drunk, to relieve aches and pains around the hips
	Sliced and boiled and mixed with other herbs, to restore and clean the womb
Plant Part	Leaves

Scientific name:	*Hypoxis hemerocallidea*
Common Name:	African potato
Plant Use	Sliced and boiled, drunk as blood purifier
	Sliced and boiled, drunk, good for all kinds of diseases
Plant Part	Bulb

Scientific name:	*Ilex mitis*
Common Name:	Sdumo
Plant Use:	Ground to powder form, drunk to enhance and clear dreams
	Ground to powder form, bathed with to attract divine spirits
	Ground to powder form and used in attracting costumers in businesses
Plant Part:	Bark

Scientific name:	*Khadia acutipetala*
Common Name:	Khodi
Plant Use:	Added to lukewarm water and left to ferment, used as beer
	Beer increases sperm count and makes sperm stronger
Plant Part:	Root

Scientific name:	*Leonotis leonurus*
Common Name:	Wild dagga
Plant Use	Sliced and boiled, extract drunk to relief colds and sooth chest pains

iled, extract drunk to get rid of slime in babyôs throats

iled, extract drunk for hair growth

Plant Part Leaves and stem

Scientific name: *Myrothamnus flabellifolius*
Common Name: Vuka kwa bafileyo
Plant Use: Boiled and extract drunk to alleviate high blood pressure and sugar diabetes
Boiled and extract drunk to cure all kinds of colds and lung infections
Plant Part: Leaves/stem

Scientific name: *Ocotea bullata*
Common Name: Unukani
Plant Use: Ground to powder and smoked to relieve headaches and migraines
Ground to powder form, mixed with water and drunk for blood purification
Bathed with to relieve itchiness
Sprinkle around yard to remove evil spirits
Plant Part: Bark

Scientific name: *Ophiocaulon gummifera*
Common Name: Phinda
Plant Use: Ground to powder form, powder blown from the hand to return evil spirits to the owners
Good for hair, mixed with rosemary to wash hair
Mixed with *Bersama lucens* and *Acacia xanthophloea* for luck in the work place
Plant Part: Stem

Scientific name: *Pentanisia prunelloides*
Common Name: iscimamlilo

wder form, powder mixed with baby jelly and to affected area. Heals burns

Boiled and extract drunk, good to relieve period pains

Boiled and extract drunk, for general pains and aches in the body

Plant Part: Roots

Scientific name: *Peucedonum galbanum*
Common Name: bergseldery
Plant Use: Sliced and boiled, drunk to relieve chest problems
Plant Part: Leaves

Scientific name: *Plumbago auriculata*
Common Name: Umabophe
Plant Use: Ground to powder form and sniffed to make dreams clearer

Chewed to solve marital problems

Sprinkled on retail products, to bring good business

Plant Part: Stem

Scientific name: *Polygata hottentotta*
Common Name: Lehlokwanana la tsela
Plant Use: Chewed (root)

Carried around for luck (root)

Sliced and boiled, extract used in vomiting rituals (root)

Together with other herbs mixed with porridge to cure womb cancer (root)

Grass burnt to remove evil vibrations

Ashes of grass used in preparing hides and skins

Plant Part: Root/grass

Scientific name: *Prunus africana*
Common Name: Inyazangoma
Plant Use Sliced and boiled, extract used to relieve period pains.

Scientific name:	*Ptaeroxylon obiquum*
Common Name:	Nieshout
Plant Use	Ground to powder form and sniffed, good for sinuses and headaches
Plant Part	Bark and stem

Scientific name:	*Raphionacme velutina*
Common Name:	Kgaba
Plant Use	Ground to powder form mixed with water, drunk to kill tapeworms Ground to powder form mixed with water, used to shed umbilical cord in babies
Plant Part	Root

Scientific name:	*Ptaeroxylon obliquum*
Common Name:	Umtati
Plant Use:	Boiled and extract drunk to relieve colds on the chest Ground to powder form and sniffed, good source of all kinds of vitamins Ground to powder form and sniffed to relieve migraines and headaches Ground to powder form and sniffed, good for eyesight
Plant Part:	Bark

Scientific name:	*Ruta graveolens*
Common Name:	Garden rhu
Plant Use:	Sliced and boiled, good for all kinds of chest infections (drunk) Sliced and boiled, extract used for eyesight restoration (wash face with) Sliced and boiled, extract drunk to cure arthritis Sliced and boiled, stimulates hair growth (wash hair with)

wder form, powder eaten to relieve indigestion and
s

Sliced and boiled, good appetite stimulant (drink)
Gurgle with extracted water to cure tonsillitis
Used as tea

Plant Part: Leaves/stems

Scientific name: *Scabiosa columbaria*
Common Name: Bega mina ngedwa
Plant Use: Chewed or extract bathed with for luck and attraction of the opposite sex
Mixed with other herbs for luck
Plant Part: Roots

Scientific name: *Sutherlandia frutescens*
Common Name: Cancer bush
Plant Use: Sliced and boiled, extract drunk for blood purification
Smoked to calm nerves, good for restoring the central nervous system
Sliced and boiled, good for all kinds of chest infections (drink)
Plant Part: Stems/leaves

Scientific name: *Talinum caffrum*
Common Name: Inkucula/ Umhuncuka bemphethe
Plant Use: Ground to powder form, powder eaten to cure kaffir poisoning
Mixed with eucalyptus, boiled and drunk to rebuild lungs and cure bronchitis
Sliced and boiled and used for vomiting rituals, i.e. to clean the digestive tracts
Ground to powder form and sprinkled around the yard for protection
Good as fish bait, mixed with seafood
Plant Part: Roots

Scientific name:	*Thesium hystrix*
Common Name:	White maisale
Plant Use	Stem ignited to communicate with ancestors
	Burnt and inhaled, smell restores mental state
	Carried, used as a lucky charm
Plant Part	Rhizome

Scientific name:	*Thesium sp*
Common Name:	Red maisale
Plant Use	Ground to powder form, mixed with water and sprinkled to remove evil vibrations
	Ground to powder form, mixed with water and bathed with for luck in court cases
	Carried around it to provide spiritual guidance and luck
Plant Part	Root

Scientific name:	*Tulbaghia alliacea*
Common Name:	Moêlêla
Plant Use:	Ground to powder, sprinkled with water or bathed with to strengthen business
	Mixed with *Hypoxis hemerocallidea* and ñdarsie pisò (urine from a skunk) to cure bladder problems
	Sliced and boiled, drunk to cure prostate problems
	Ground to powder form, powder uses for abortion purposes
	(Not to be taken in high doses, poisonous)
Plant Part:	Root

Scientific name:	*Tulbaghia violacea*
Common Name:	Wild garlic
Plant Use:	Sliced and boiled, water drunk to cure kaffir poison

iled, cures all kinds of colds (drink)

iled, water sprinkled in the yard. Acts as a snake repellent

Used for cooking, adds taste to food

Plant Part: Bulb

Scientific name: *Typha capensis*

Common Name: Ibhuma

Plant Use: Ground to powder and mixed with porridge, given to young mothers for milk production

Ground to powder and mixed with milk for men to produce strong sperm

Plant Part: Rhizome

Scientific name: *Urginea epigea*

Common Name: Mhlabelo

Plant Use: Sliced and boiled, extract drunk for arthritis

Sliced and boiled, extract drunk to heal operations, sours and gun-wounds

Sliced and boiled, extract drunk to cure stroke

Plant Part Bulb

Scientific name: *Viscum capense*

Common Name: Wild tea/ mistle tea/voolend

Plant Use: Used as tea

Sliced and boiled, extract drunk for bladder problems

Sliced and boiled, drunk to cure headaches

Sliced and boiled, extract used as a skin toner. Good for skin

Plant Part: Stems/leaves

Scientific name: *Warburgia salutaris*

Common Name: Sbaga/ Isihaha

Plant Use Ground to powder form, extract drunk to cure low blood pressure

wder form extract drunk or mixed with food to reduce cholesterol

Ground to powder, steamed with to restore bad eyesight

Sliced and boiled, drunk to relieve aches and pains on the back and to purify blood

Sliced and boiled, given to animals as drinking water to increase their reproductive output.

Plant Part Bark

Scientific name: *Withania somnifera*

Common Name: Ubuvimba

Plant Use Sliced and boiled, drunk by women to clean the blood of contraceptives

Sliced and boiled, drunk to rebuild the womb

Sliced and boiled, drunk to clean the bladder and strengthen it

Plant Part Root

Scientific name: *Xysmalobium undulatum*

Common Name: Itshongwe

Plant Use Sliced and boiled, drunk to cure diabetes

Ground to powder form and sniffed to relieve sinuses and clear heads

Plant Part Root

Unidentified species

Scientific name: Unknown

Common Name: Mosiane/melktisin

Plant Use: ground to powder form and bathed with to remove evil vibrations

Used for washing hands after funerals, to keep away the spirit of death

iled, extract used in vomiting rituals, i.e. to clean the
t

Sliced and boiled, given to young mothers to stimulate milk production

Plant Part: Stems

Scientific name: Unknown
Common Name: Thota madi
Plant Use: Boiled and extract drunk, used as a blood purifier
Boiled and extract drunk, used for curing high blood pressure
Used as an enema to fight STDs
Ground to powder form and mixed with baby jelly, good for healing boils and piles,
Plant Part: Root

Scientific name: Unknown
Common Name: Tabula Valo
Plant Use: Ground to powder form and mixed with water, taken in orally and spat out, to get rid of shyness and fright. Calms the nervous system.
Boiled and extract drunk, good for weak hearts
Plant Part: Bark

Non-plant Material

Scientific name: Calcrete
Common Name: Morena wa Mahlo
Use: Dissolved in water and used for vomiting rituals
Dissolved in water and gurgled with to get rid of heartburn.
Dissolved in water and sprinkle in the yard to get rid of evil vibrations
Part used: N/A

Scientific name:	Cuttlefish Shell
Common Name:	Morena wa Mahlo
Use:	Ground to powder form, mixed with water and used as an eye drop
	Ground to powder form to bathed with for luck.
Part used:	N/A

Scientific name:	Monkey excretion
Common Name:	Masepatshwene
Use:	Ground to powder form, mixed with water and sprinkled in the yard to remove evil vibrations (can also wash with)
Part used:	N/A

Scientific name:	Sea Algae
Common Name:	Mavumbuka
Plant Use:	Sliced and boiled, purifies blood (drink)
	Sliced and boiled, good for kidneys (drink)
	Used as an enema, good for kidneys
Plant Part:	Roots

Scientific name:	Sea animal shell
Common Name:	Legala la badimo
Use:	Burnt and powder used to remove birthmarks,
	Burnt and powder used as an antiseptic
Part used:	N/A

APPENDIX III

PHOTOGRAPH IC RECORD OF SPECIES SOLD BY THE HERBALIST

Picture of the market place located within the Kimberley city centre, Northern Cape of South Africa, indicating the size of the market place as well as various materials traded.

Scientific name: *Acacia xanthophloea*

Common name: Makhanyakude

Scientific Name: *Synaptolepis kirkii*

Common Name: Vuma (White plant)

Scientific Name: *Bersama lucens*

Common Name: Isindiyandiya/Lufudo

Scientific name: *Cassine transvaalensis*

Common name: Ingwavuma

Scientific Name: *Dioscorea sylvatica*

Common Name: Skilpad

Scientific Name: *Elaeodendron transvaalensis* or *Dolichos falciformis*

Common Name: Ingwavuma

Scientific Name: *Erythrina lysistemon*

Common Name: Lucky beans

Scientific Name: *Eucalyptus sp*

Common name: Eucalyptus

Scientific Name: *Eucomis autumnalis*

Common Name: Umathunga/ Mpukanele

Scientific Name: *Glycerrhiza gabra*

Common Name: Mlomo mnandi

Scientific Name: *Hypoxis hemerocallidea*

Common Name: African Potato

Scientific Name: *Leonotis leonurus*

Common Name: Wild dagga

Scientific Name: *Myrothamnus flabellifolius*

Common Name: Vuka kwa bafileyo

Scientific Name: Unknown Species

Common Name: Thota madi

Scientific name: *Ophiocaulon gumnifera*

Common name: Phinda

Scientific Name: *Plumbago auriculata*

Common Name: Umabophe

Scientific Name: Unknown sp

Common Name: Matlyuala

Scientific Name: *Polygata hottentotta*

Common Name: Lehlokwa la tsela

Scientific Name *Sutherlandia frutescens*

Common Name: Cancer Bush

Scientific Name: *Thesium sp*

Common Name: Red maisale

Scientific Name: *Tulbaghia sp*

Common Name: Red Onion

Scientific name: *Warburgia salutaris*

Common name: Isigaba/Isibaha

Scientific Name: *Withania somnifera*

Common Name: Ubuvimba

Scientific name: Unknown sp

Common name: Mpendula

Non-Plant Material traded as medicinal remedies

Scientific Name: N/A

Common Name: Ostrich shell

Scientific Name: N/A

Common Name: Porcupine tummy

Scientific Name: Sea Algae

Common Name: Moelela

Scientific Name: N/A

Common Name: Red Sea Algae/Mabophe