Indigenous Plant Use in Gxalingenwa and KwaYili Forests in the Southern Drakensberg, KwaZulu-Natal

by

Ngcali Nomtshongwana

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ABSTRACT

In response to an increase in forest destruction, nature conservation agencies in South Africa are beginning to introduce innovative and integrated conservation strategies. This study was established to provide information on resource use in Gxalingenwa State Forest (GSF) and KwaYili State Forest (KSF) on which such conservation initiatives might be based. Local villagers in the area depend on a mix of forest products to meet their livelihood needs, including for example heating, cooking, fencing, building, craft-work and medicine.

Large quantities (102.072 tonnes) of plant resources are removed from the GSF and KSF annually by traditional healers and commercial gatherers with commercial gatherers responsible for the largest proportions (88.1 %). However, the total market value of medicinal products to the resource users is higher than the local value, implying that the resource users are not harnessing the full potential of the forest products. Fuelwood, building, fencing and carving also account for a large bulk of materials harvested from the indigenous forests annually.

Among several species, *Podocarpus falcatus* is the most preferred and harvested tree for fuelwood, fencing and building. Despite its high recruitment level, it shows a very unstable population structure. *Calodendrum capense* is debarked for medicinal uses. It is used locally and its current harvest by commercial gatherers is driven by a huge demand from the 'muti' markets. In KSF, *C. capense* generally has a low density but also has a relatively good recruitment rate when compared with an unexploited forest. However, the harvesting of immature stems pose a threat to this species.

PREFACE

The research described in this dissertation was conducted at the School of Environment and Development and the Forest Biodiversity Programme (Department of Zoology and Entomology) at the University of Natal under the supervision of Prof. Mike Lawes (Dept. of Zoology and Entomology) and Mr Myles Mander (Institute of Natural Resources).

This study represents original work by the author and has not otherwise been submitted in any form for any degree or diploma to any other University. Where use has been made of the work of others, it is duly acknowledged in the text.

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CHAPTER ONE
INTRODUCTION

1.1 Conservation and Sustainable Forest Resource Use in South Africa

In South Africa, indigenous forests both in private and communal ownership provide a wide range of products and services. Forest resources are used as both commercial and subsistence products, e.g. for medicine, heating, cooking, craftwork, fencing and building purposes. In addition, forests provide shelter, maintain water quality and reduce soil erosion. Indigenous forests also provide a visually pleasing environment and a species-rich habitat which supports recreation and a thriving eco-tourism industry in South Africa. Yet, humans have played a major role in the destruction of indigenous forests in the country.

Most natural forests occur in the Eastern Cape (about 140 000 ha) and in KwaZulu-Natal (about 91 200 ha), followed by other regions. Forests tend to occur in patches, few of which cover areas greater than $1km^2$, with areas greater than this only common along the Garden Route and Lowveld Escarpment (Low & Rebelo, 1996). Added together, indigenous forests cover less than 0,25% of southern Africa's surface area, making this the smallest biome on the subcontinent (Low & Rebelo, 1996). Despite the forest destruction that has occurred over the past three decades, much of the natural forest has survived (McCracken, 1987). Currently, however, there are reports of renewed forest destruction in some parts of the country, for example in Mt. Thesiger Forest Reserve Pondoland (Obiri, 1997). With the changing political environment in South Africa, there is increased pressure on traditionally conserved areas, such as allowing grazing by domestic stock.

One of the most important wilderness areas under pressure in South Africa is the Natal Drakensberg mountain range. Many forests in this region have deteriorated within a short period of time (past decade) due to the high levels of exploitation, and unless strict and sensible management is instituted in these forests, they will become utterly degraded. This will result in ecological loss, for example loss of water production, and inevitably in economic costs. In response to the increasing forest destruction, nature conservation agencies in South Africa are now gradually introducing integrated conservation strategies. The World Conservation Strategy encourages the use of resources that will yield the greatest sustainable present benefit and simultaneously not prejudice the interest and aspirations of future generations (IUCN, 1980).

Medicinal plants and substances derived from forests have always played an important role in traditional health systems (Cunningham, 1988). In a recent study, Mander (1998) estimated the total number of people using the services of traditional healers in South Africa to be 84%. Over the past 100 years medicinal plant use in South Africa has changed from the specialist activity of herbalists (*Izinyanga*) and diviners (*Izangoma*) to a thriving trade involving hawkers and gatherers (Cunningham, 1988). The plant trade is believed to generate a large volume of economic activity, with an estimated value of R500 million per annum. Most of the plants sold are harvested from wild populations (Mander, 1998).

KwaZulu-Natal is an area of active medicinal plant harvesting, trade and consumption, with the city of Durban forming the hub of the regional plant trade (Cunningham, 1988). The population of the province in 1996 was estimated to be 8.7 million, with the black population comprising 83% of the total population or 7.2 million people (Central Statistical Service, 1996). Assuming that 84% of the black population use indigenous medicine in KwaZulu-Natal, the number of potential users in the province could be 6 million people. Based on an average frequency of 3.34 visits per user per year, (i.e. 20 million uses of plant products per year), and assuming an average mass of 216.5g per user, then the total quantity of medicinal plants used in KwaZulu-Natal could amount to 4 339 tonnes (Mander, 1998). In Durban alone there are an average of 380 street traders and 51 shop traders operating in the 'muti' markets (Mander, 1998). With poverty being a problem within many rural communities in the region, the traders' numbers might have risen further still since then. This represents considerable pressure on forests and other natural resources.

The scale of harvesting, the destructive methods used, and a lack of cultivation have contributed to a decline in plant populations throughout KwaZulu-Natal and surrounding areas. In southern KwaZulu-Natal forests, some 51% of *Ocotea bullata* trees and 57% of *Curtisia dentata* trees were estimated to have had more than 50% of their bark removed (Cunningham, 1988). Although attempts to manage controlled gathering are made in nature reserves and conservation areas this does not keep up with the level of market demand (Cunningham, 1988).

The uncontrolled use of forest resources by local communities for subsistence purposes also accounts for a large part of the reported destruction and disappearance of forests (Cunningham, 1988). Shone (1985) estimated that 60 000 ha would have to be planted to woodlots in order to meet the fuelwood and other harvesting requirements of the rural population of Transkei just south of KwaZulu-Natal. Conservation in these circumstances cannot be achieved by passive measures, as has been the case in the past, and protection of species by legislation and control of proclaimed reserves is tantamount to wishing away the massive market demand (Cunningham, 1988).

The decline of indigenous forest resources in both communal and state controlled areas, resulting from over-use, has caused the current government to realise its own inadequacies in terms of management in these areas. This has prompted several conservation departments to explore more socially responsive options when dealing with forest problems (Kamstra, 1994). In South Africa, the Department of Water Affairs and Forestry (DWAF) has recently passed various new forest policies. For example, a White Paper on Sustainable Forest Development identifies, among other things, the need to create a positive environment for community forestry, which includes securing tenure and developing income opportunities from forest enterprise. Part 3 of the National Forest Act (Act No 84 of 1998) allows communities that wish to engage in community forestry to enter into agreements with the Minister. In translating the vision of the White Paper on Sustainable Forest Development into concrete and descrete actions, DWAF has further published a National Forestry Action Programme (NFAP). However, despite the available good policies and legislation, the conservation agencies have yet to effectively implement them. This study, as a response to the new forest policy, investigates ways in which both the resource users and managers can jointly work together towards sustainable forest management goals.

KwaZulu-Natal Nature Conservation Service (KZNNCS) has, in the interim, adopted a "Policy on Neighbour Relations" which gives effect to an innovative and far-reaching programme of engagement with communities, particularly those near protected areas. The policy aims to involve local communities in all conservation management programmes. New approaches to wildlife conservation reject 'protectionist' policies and encourage the sustainable use of wildlife resources (Martin, 1986) and the inclusion of local people in the planning and management of conservation areas to make them more acceptable to poor rural communities (IUCN, 1980). The World Conservation Strategy advises and encourages conservation organisations to work closely with neighbouring communities if conservation of natural resources is to be realised (IUCN, 1980).

Although local participation is now part of most conservation plans, the actual methods for achieving this are not well developed (Kamstra, 1994). In KwaZulu-Natal, the community conservation programme has experienced problems of coordination, direction and the allocation of resources (S. Roberts, pers. comm). This is partly due to the changing nature of the roles of conservation officers who are now also required to offer community extension services. Such problems are exacerbated by long standing mistrust of conservation agencies by local communities. However, if forests are to be conserved then one of the strategies to reduce land-use conflict is to convince the current users that forests are worth conserving, not just for them but also for the future generation.

In spite of all the number of scientific studies carried out in forest reserves in South Africa, and the fact that conservation and development conflicts relate directly to human needs, information on integrated management of forest resources remains inadequate (Cunningham, 1985). This is a general problem in Africa that slows progress in conservation (Cunningham, 1985). In southern Africa, ethnobotanical studies have been largely limited to mainly recording the uses of plant species and their vernacular names (Liengme, 1983) with little focus on socio-economic potential. An understanding of the relationship between forest use and socio-economic status is, however, critical to a full understanding of forest change (Campbell, 1996).

There is a need not just to investigate and quantify people - plant interaction. This study aims to provide an understanding of the forest resource base and socio-economic factors influencing the use of forests, and establish a sound basis for the formulation of policy guidelines for effective management of forests.

1.2 History of Resource Use and Conservation of southern Drakensberg forests-Pholela District

During the last century Afromontane Mistbelt Mixed *Podocarpus* forests were scattered throughout the Pholela district and were generally considered to be of little practical importance, but were managed as protected forest areas by State forestry (Fourcade, 1889). They were later organised into the forester patrols of Ngwangwane, Bulwer and Xumeni. Under Ngwangwane patrol were Gxalingenwa State Forest (GSF), Kwa-Yili State Forest (KSF), Hlabeni State Forest (HSF) and Emakazeni State Forest (ESF). During the 1890's, Schopflin (a forester and farmer) described GSF as "a truly magnificent forest" and, for its size, the finest he had seen in South Africa. This may be attributed to relatively less tree destruction in GSF compared with other forests. Due to the perceived value of GSF at the time, Schopflin, with the approval of the old Natal Native Trust Board, arranged in December 1892 for 1 224 ha of the Mcatsheni Crown lands be exchanged for the 1229 ha of larger Gxalingenwa reserve and had it demarcated together with KwaYili, Hlabeni and Emakazeni. As a result of this exchange, it became necessary to appoint an additional forest guard to patrol the four forests.

Although there has not been much conservation management of the forests in the last 60 years, legal protection has prevented their full-scale destruction. In the late 1930's permits to collect forest materials, especially fuelwood, were sold for 3 pence by a forest patrol officer who was stationed at Gxalingenwa village (Mr and Mrs Dlamini, pers. comm.). The permits were valid for one week and the holder was only allowed to collect twice during that period. Two guards from whom permits could be bought patrolled the forests.

During the devolution of state forests in 1987 to provincial conservation departments by the former Department of Forestry, GSF and KSF were given to the former KwaZulu Department of Nature Conservation. This conservation agency however then shifted the forest management responsibility to the local *inkosi* (Traditional leader), who took charge of protecting the forests and providing permits to the local people (P. Thomson, pers. comm.). The *inkosi* later appointed forest guards from the community. The shift of responsibility to the tribal authority was done in a bid to win the local population's co-operation in the sustainable use of the forests. This approach was introduced when medicinal plant harvesting by commercial gatherers was becoming uncontrollable. Local people obtained permits (locally known as tickets) from the *inkosi* before using the forest resources. However, during the inception of the arrangement between the *inkosi* and the conservation agency the community's needs and views on management of the forests were not considered. Consequently, the forest guards were often victimised by members of the community who wanted to use the forests. Due to attacks on persons and family houses, in 1988 the guards demanded payment or compensation from the *inkosi*. These requests were ignored and the guards subsequently abandoned their posts leaving forests unguarded (V. Zondi, pers. comm.).

Government forest guards who worked permanently at Hlabeni forest seldom patrolled either, GSF or KSF. During the late 1980's feuding among the people of Emasameni an area neighbouring these two forests, left many dead and without shelter or food. The lives of the forest guards were threatened and they left their jobs abandoning the forests to further exploitation by local people. Due to the exploitation and degradation of these forests the KZNNCS was given a mandate in 1989 by the KwaZulu Department of Nature Conservation to manage GSF and KSF. In spite of this however the forests have continued to be exploited for both commerce and subsistence. Uncontrolled use of natural resources in these forests has inevitably led to heavy disturbance in some areas (more especially KSF). GSF and KSF once had high plant species richness which has declined and many plants, eg. *Ocotea bullata* (black stink-wood), are now poorly represented in the larger GSF and absent from KSF (M. Langa, pers. comm.).

Plant products from GSF and KSF are not only of local significance. Recent high rates of use in the area have resulted from a shift in individual household use to a thriving commercial trade in the surrounding larger markets. Medicinal plant products in both forests are mostly affected by this trade. A newly constructed road which passes through both forests has increased the ease of access to these forests and promoted the trade. In November 1995, a workshop was held by members of the KZNNCS to determine future management strategies in the GSF, however, due to a lack of community involvement these became prescriptive strategies. As a result, it was later felt by the KZNNCS officials that the strategies should be abandoned. To date there has been very little environmental development research done in the area. Thus, there is a need to develop a conservation strategy in order to rapidly address the environmental problems in the two forests.

1.3 Aims and Objectives

Cooper (1985) categorised KSF and GSF, as better examples of the Afromontane Mistbelt Mixed *Podocarpus* forest in KwaZulu-Natal. He stressed the need to protect them from illegal exploitation, especially the use of the bark of certain trees such as *Ocotea bullata* and *Calodendrum capense*. Despite this caution there are still no regulations or rules guiding the use of these forests. GSF and KSF were chosen for this study because they are illustrative of the consequences of degradation suffered by many forests in the region (Cooper, 1985) and that resources from these forests are important to the economy and welfare of the surrounding rural communities. The aim of this study is to develop a holistic conservation strategy for sustainable management of KSF and GSF. The objectives of the study were:

1. to determine which forest products are used by the local people;
2. to quantify the current resource availability of two high-value indigenous plants, i.e. determine their general distribution, size-class distribution and density;
3. to assess the cultural and direct economic value of the plants in each resource utilisation category i.e. medicinal, firewood, carving, building, and fencing;
4. to gain a deeper understanding of the socio-economic profiles of the area;
5. to provide management guidelines for the interaction between KZNNCS and the local community aimed at ensuring sustainable forest use.

1.4 Summary of the Thesis Structure and Approach

This thesis explores the harvesting, use and value of plant resources from two indigenous forests in KwaZulu-Natal South Africa. Chapter one introduced the general status of forest conservation and the use of forest resources in South Africa, with emphasis placed on KwaZulu-Natal Province and examined the history of resource use and conservation in the southern Drakensberg forests. Chapter two introduces the study area. Plant resource harvesting is defined in Chapter three, and information about the quantities harvested, people involved, methods used when harvesting and a list of resources harvested in the forests is provided. Chapter four examines the direct use value of the harvested resources to the local communities and identifies the local socio-economic indicators to aid forest managers in understanding the dynamics of resource users.

Chapter five focuses on the availability of high-value resources, i.e their distribution and density, at KwaYili State Forest and compares it with that of Hlabeni State Forest (a control forest). In chapter three, four and five the methods used during surveys are described. A comparison of resource availability and harvesting is also provided. Finally, general conclusions and recommendation are laid out in chapter six.

CHAPTER TWO
STUDY AREA

2.1 STUDY AREA

2.1.1 Location

Gxalingenwa State Forest and KwaYili State Forest are situated to the immediate south of the Umzimkulu River Valley at the foothills of the Drakensberg mountain range, about 30 km south west of Bulwer, in KwaZulu- Natal region, South Africa. GSF lies at 29°37′45″S 30°5′55″E and KSF lies at 29°40′45″S, 29°58′50″E (Figure 2.1). The forests are surrounded by rural villages. The forests are classified as typical Afromontane Forest, sub-type Mistbelt Mixed *Podocarpus* forest (Cooper, 1985). GSF is approximately 616 ha in extent, and KSF is 273 ha (Cooper, 1985). Both forests form part of larger reserves which include a grassland matrix (GSF= 884ha and KSF= 404ha).

2.1.2 Topography

The area falls within Acocks veld type 44a, Highland Sourveld (Cooper, 1985). This is a veld of the eastern slopes and foothills of the Drakensberg from about 1350m - 2150m above sea level (Acocks, 1988). The forests are both situated on steep south facing slopes of the Montane Belt escarpment between 1250m - 1800m in altitude and in first or second order stream valleys (Everson, 1994).

2.1.3 Climate

Although total rainfall is important in the growth of vegetation, the distribution of rainfall, and especially the length of the dry season are limiting factors in this region (Everson, 1994). The area is a mid-summer rainfall region and conditions are particularly dry in June and July (Schulze, 1997). The area receives a median monthly rainfall in excess of 160mm in January and between 5 - 10mm in July. Average annual rainfall ranges from 750-1500mm (Acocks, 1988).

The mist fumigation effect is evident in the area, more especially in KwaYili forest during the

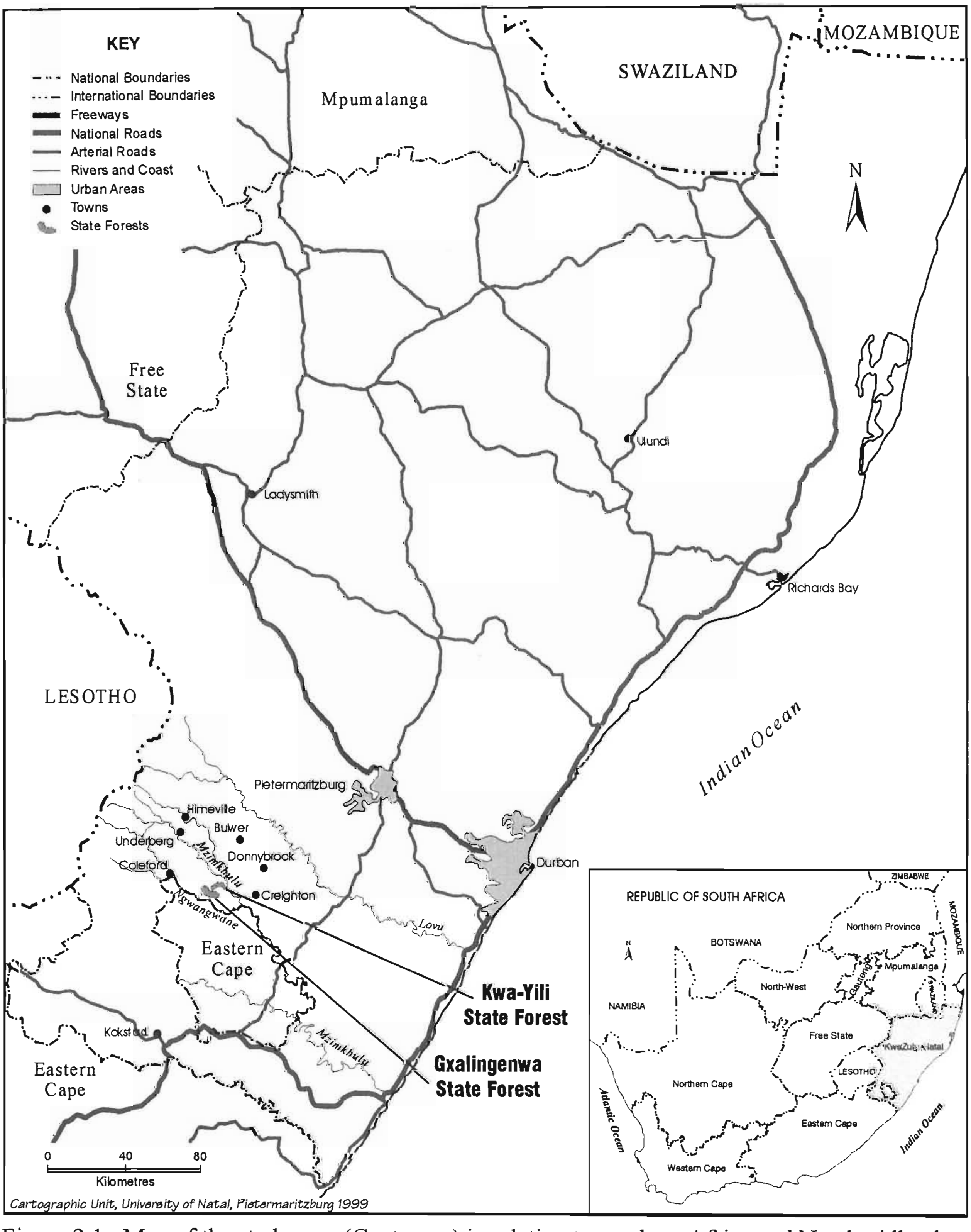


Figure 2.1: Map of the study area (Centocow) in relation to southern Africa and Natal midlands

winter season with the mist only disappearing at midday. Winter mists are frequent and provide an important moderating role on temperatures and humidity in the forests at the time when there is little rainfall (Acocks, 1988). The mean daily maximum temperatures range between 24 - 27°C in January and between 14-18°C in July (Schulze, 1997). The mean daily minimum temperatures range between 10 - 14°C in January and between 2 - 6°C in July. The coldest month is therefore July with mean daily temperatures ranging between 8 - 10°C and the hottest month is January with mean daily temperatures ranging between 20 - 22°C.

2.1.4 Vegetation

Characteristic species for this forest type include *Podocarpus falcatus, Podocarpus latifolia, Xymalos monspora, Celtis africana and Calodendrum capense* (Cooper, 1985). This complex contains some of the best high *Podocarpus* sp. forest in the Kwa-Zulu-Natal region. While the general condition in GSF and KSF has undoubtedly deteriorated, more especially in KSF, some areas in the two forests still have high canopies and tall, large diameter trees.

2.1.5 Land use types adjacent to the forest reserves

A piece of land adjacent to the KSF (buffer zone) was once open to the local people for cultivation before the area was managed by KZNNCS. This land was considered as common property and could be used by any family with the prior approval of the *inkosi*. After the management of the land was shifted to KZNNCS the people were not allowed to plough the land and could only graze their livestock there. Many were left with small backyard vegetable gardens which have remained a critical component of household food security for some villagers.

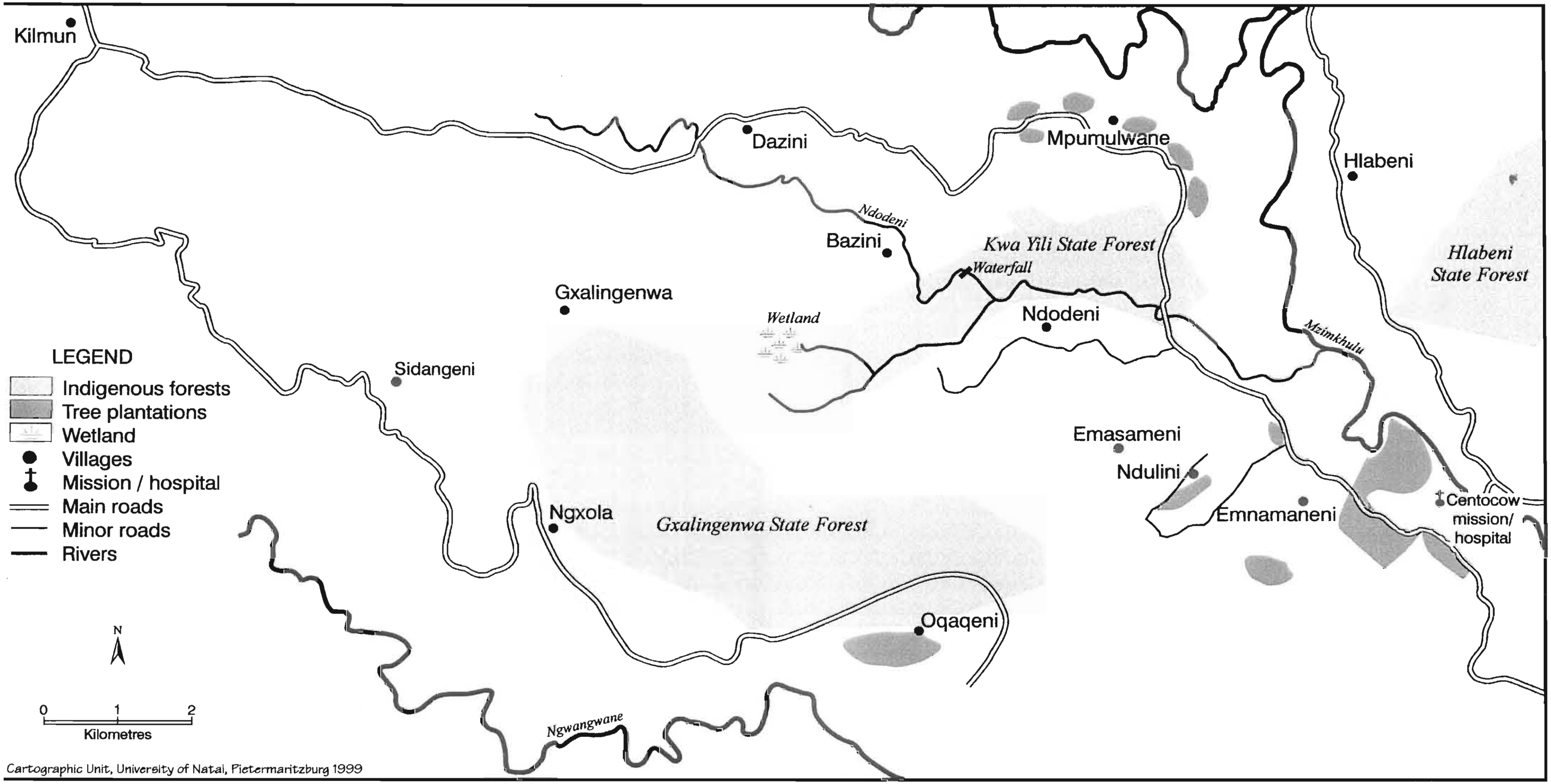
Grasslands, and in many cases forests, are used for grazing. The forests are also used by cattle as shelter. This has a potentially detrimental effect on the seedling regeneration in the forest and has led to the development of gully erosion. Forest products harvested include medicinal plants, firewood, building and fencing posts, and carving products. Debarking of *C. capense* for medicinal use is a serious problem in both forests. In some places tree felling, especially *P. falcatus,* is common and has opened up a mosaic of canopy gaps of different ages. The disturbance is quite evident in the lower slopes of KwaYili where gaps have opened up considerably and are now open fields.

From June to August most families build new houses. In June, people start building up the walls, and mud blocks are commonly used for this purpose. Immediately after that the wood posts are used as ceiling beams. This happens in July when the thatching grass is long and ready for use. By the end of August almost everyone who has enough resources (money and building materials) completes building activities. In September, villagers with backyard gardens start preparing them before ploughing - this includes fencing the gardens. In October, fields are ploughed and household gardens are prepared. Because the gardens and some fields are within reach of domestic animals, they are normally fenced. In October to mid-November, people start planting their fields and most of them, depending on which crops are planted and the condition of the crops, are harvested in February-March. This routine has been followed throughout the past fifty years (M. Langa, pers. comm.).

2.1.6 Traditional rural leadership

Indigenous management practices depend on the ability of communities to make and defend management rules (Campbell, 1996). Having effective and credible local authorities is one such requirement. However, in most countries traditional leaders no longer have any legal powers to enforce natural resource management regulations. With the changing political environment in South Africa, there is increased pressure to allow grazing by domestic stock in traditionally conserved areas.

Both KSF and GSF are situated in the Centocow area which falls under the Pholela district. The Centocow subdistrict is under the traditional leadership of *Nkosi* V. Zondi, *Nkosi* Zulu and *Nkosi* Z. Dlamini. Under *iziNkosi* (Traditional chiefs) are a number of *izinduna* whose responsibilities are to monitor village development programmes and solve social problems. *Izinduna* are village leaders and have powers to take decisions, especially when minor, and report to *inkosi* if there are any complex disputes and conflicts. Most of the villages that border the two forests, KSF and GSF, are under *Nkosi* Dlamini's jurisdiction. These villages include Gxalingenwa, Ngxola, Ndodeni, Mpumulwana, Emasameni, Oqaqeni and Bazini. Ngxola, Oqaqeni and Gxalingenwa border the GSF while Mpumulwana, Bazini and Ndodeni border on KSF (Figure 2.2). Since the take-over of forest management by KZN-NCS, the local communities do not see *Nkosi* Dlamini as a custodian of the two forests and he has subsequently lost his power to decide on how the forests should be used. The loss of power by *Nkosi* Dlamini can be partly attributed to the current political status of the country which has resulted in many rural villagers being more politicised than traditionally inclined.



igure 2.2: Schematic diagram of the study area showing Gxalingenwa, KwaYili and Hlabeni State Forests and the villages of Mpumulwana, Endodeni, ndulini and Emasameni

CHAPTER THREE
PLANT RESOURCE USE IN GXALINGENWA AND KWAYILI STATE FORESTS

3.1 Introduction

The important initiative started by Quin (1959) focussing on the wild plants to rural communities was later taken further through A S Wehmeyer's CSIR programme from 1965 to 1984, analysing work quantifying use of fuel-wood, building materials, crafts and other products done by Best (1979); Cunningham (1985, 1987, 1990a,b); Gandar (1983), Liengme (1983b) and Milton and Bond (1986). These studies have emphasised the role of indigenous plants in providing many basic needs to rural people for shelter, fuel, medicine and as source of income. Fuelwood, fencing and building accounts for the highest volume of plant material used (Cunningham, 1992). Fuelwood gathered from the forests, woodlands and exotic plantations account for 51% of domestic energy used in South Africa and represents the biggest consumption of plant biomass (Basson, 1987). Whilst considerable attention has been paid to fuelwood and energy issues, the same does not apply to 'minor plant products' (Cunningham, 1992). Traditional medicinal plants for example are an important element in the traditional health care system which 80 % of both urban and rural black South Africans continue to use (Holdstock, 1978).

Despite the mentioned role of indigenous plants to the rural people, the regulation of many protected areas in the world still strictly prohibit gathering of plant resources within protected areas or reserve borders (Martin, 1995). This policy applies to many South African forests, and thus to local people, even those who have traditionally had access to protected areas and possibly practised sustainable ways of harvesting natural products. Local communities have been denied access to state forests and were forced to continue their activities in areas around the forests, which lack the required forest plant resources. As a consequence, many of them are involved in unlawful harvesting of forests resources.

Gxalingenwa State Forest and KwaYili State Forest are harvested for large quantities of products without any proper management control. Important products harvested from these forests include materials for medicine, heating, cooking, carving, poles and building products.

Species use is highly selective and based on factors such as durability of building products. The scale of harvesting, the destructive methods used, and the lack of cultivation of alternatives have contributed to a decline in plant populations in both GSF and KSF, and throughout KwaZulu-Natal and surrounding areas (Cunningham, 1988). Such exploitation can drive certain species to extinction and has led to concern regarding the sustainable use of forests.

The prime importance of forest plant resources to the local communities in Centocow, and the rapid deforestation in the area, raised a set of questions for investigation: (i) What is collected; (ii) Why is it collected; (iii) Who does the collecting; (iv) How much is removed; (v) How often is it removed; (v) How are these collected? Cunningham (1989) emphasised the need to incorporate the above set of questions into land-use planning and conservation programmes, emphasising the value of wild plants as a source of satisfying basic needs and as a buffer against rural poverty. This chapter, therefore, is a response to this call and provides information on the above questions that are prerequisites for a sound forest conservation strategy.

3.2 Research Methods

Permission to work with the local people in the area was first obtained from the traditional authority. The traditional authority was helpful in identifying key resource groups and individuals in the area. After an introductory meeting with the key people the next step involved gaining their acceptance and confidence by first explicitly articulating the aims and objectives of the research. After understanding the research significance and value to their community, they were willing to co-operate and participate whenever necessary.

A combination of quantitative and qualitative methods were used for the research. A qualitative survey was conducted using Participatory Rural Appraisal (PRA) (Chambers, 1983). PRA is a process centered on the principle that seeks multiple perspectives through group enquiry (Nabasa *et al.*, 1995). The use of PRA provided an insight into qualitative data not obtainable through quantitative techniques. Qualitative research methodology combined two tools, key informant interviews and focus groups. The key informants were engaged in both informal and formal interviews. Both key informants interviews and focus groups were conducted as a primary method of acquiring information from the communities.

Key informants were chosen from the people with influence in the communities, current and past resources users. They included a local *inkosi,* councillor, former builder, firewood gatherer, medicinal plant gatherer and traditional healer. In total, six key informants were interviewed. In order to ensure that opinions from both gender groups were obtained, both women and men were interviewed. Participants in the focus groups were selected from the existing key resource groups e.g development committee, commercial 'muti' gatherer, subsistence forest resource users and traditional healers. Traditional healers were the major participants and informants throughout the research process. In order to ensure homogeneity and avoid over-dominance in the focus groups the numbers were restricted to between five and six people. This encouraged both openness and good participation, giving all participants a chance to express their opinions without fear. The list of plant used from GSF and KSF was drawn up from information obtained from key informants interviews.

Quantitative surveys were performed in order to determine the socio-economic profiles of the resource users and local plant use of the forests. A structured questionnaire (Appendix 1) which was designed using the information gathered during qualitative research was used. The questionnaire was therefore partly used to substantiate qualitatively ambiguous data gathered during the initial interviews with key informants and in focus groups. Local plant use information was obtained for firewood, building, fencing and medicinal materials. Socio-economic data on literacy, occupation, gender, age and income levels were sought.

The survey was administered to 60 households, selected randomly and equal to approximately 10% of all the households in the sampled area. The survey was done through face-to-face interviews with respondents who lived permanently in the area and gathered forest products for any purpose. Due to sparse distribution of villages in the area, with some closer to the forest than others, the villages in the area were divided into two sampled strata, i.e. those that live away from the forest, and those closer to the forest. Thirty questionnaires were administered in each stratum. This was done primarily to ensure that there was a balance across the communities. The *a priori* assumption was that for building, fencing, and firewood, those communities neighbouring the forest were more dependent on the forest resources. For carving, the *a priori* was that there was a balance across the communities. Three villages (Endodeni, Mpumulwana and Emasameni) closest to KSF were sampled while the one (Endulini) furthest away from KSF was also sampled.

For building and fencing purposes, quantities were based on counts (e.g. number of posts). In order to determine the quantity of posts used and how often households were building new houses (or replacing rotting ceiling beams) and fencing their gardens, a survey of the homesteads around the forests was conducted. Fifteen households with newly built houses were asked when they last built houses and the number of posts used. During household interviews, 20 resource users were asked similar questions for fencing purposes. These provided a mean number of posts used and of years over which a single household would build a new house or fence its garden. The average size of a single post that the local villagers use was taken as the standard size that the nearest timber wholesale and the local mission plantation supplied to rural people.

Before making any assumptions about medicinal products harvested, a distinction between the use by traditional healers and commercial gatherers was considered. The *a priori* assumption was that medicinal products were gathered commercially by members of the community living next to the forest whereas for healers, there was a balance across the communities. Self-medication was not considered for quantifying purposes because community members were in most cases using the services of local traditional healers. The quantity of self-medication was therefore considered insignificant and the assumption was that it would not interfere with the results. Estimates of medicinal plant products harvested from both KSF and GSF, were therefore based on the quantities harvested by healers and commercial gatherers. Since the study objectives were to be best achieved through the collection of qualitative and quantitative data and because indigenous healing was a specialist activity, 12 more interviews were conducted with traditional healers (for medicinal plant use information). A total, of 72 structured questionnaires were therefore administered.

Commercial gatherers were either in the forest or at the 'muti' markets during the survey, consequently no data could be gathered from them using questionnaires. They were suspected to be hiding or giving false identity during the interviews because they feared being arrested. However, with the help of the local councillor (Cllr. Mbanjwa), informal interviews were conducted with three commercial gatherers. From these interviews all the valuable needed information was ascertained, for example the number of gatherers involved, transport system used, quantities harvested, expenses incurred, and frequency of collection and frequency of visiting the market. Quantities of medicinal plant material harvested were based on masses (e.g. mean weight of a bag filled with medicinal plants). The same quantifying method was used to estimate the mean weight of fuelwood headloads. The frequencies of use for fuelwood and medicinal plants by traditional healers was established using a structured questionnaire. All data analysis were done using the SAS statistical analysis computer package.

Out of a sample size of 60 households, the breakdown of different plant products harvested is given in Table 3.1.

Table 3.1: Categories of forest products acquired by households (n=60). (Harvesting = H.); (Not harvesting = N.h)

Medicine		Building		Fencing		Fuelwood		Carving	
H.	13.3%	H.	60%	H.	38%	H.	88.3%	H.	0.02%
N.h	86.7%	N.h	40%	N.h	61.7 %	N.h	11.7%	N.h	99.08%

3.3 Results

3.3.1 Medicinal plants

Medicinal plants are harvested by the local villagers from both KSF and GSF for commercial and subsistence use. Most traditional healers and all commercial gatherers in the area are women (Plate 3.1). Commercial gatherers are the major harvesters of medicinal plant materials and are dependent on this trade for their survival. They are specialists and normally focus on one or two plant products although this may be supplemented depending on the availability of medicinal plant materials.

Bark, roots and bulbs are the major source of medicinal material (Plate 3.2). Of the 47 indigenous species reported for medicinal use, 34 (72%) of them are available and currently harvested from the two forests (Table 3.2). Of these, 15 (44%) are not only used locally but are harvested for commercial trade in urban 'muti' markets. Thirteen of the commercially harvested plants were found in both forests, while *Prunus africana* and *Andrachne ovalis* were found only in GSF. *Calodendrum capense* was found in both GSF and KSF and its bark was the most sought after by commercial gatherers. *Scilla natalensis*, *Tulbagia sp.*, *Anemone sp.*, *Prunus africana*, *Brachyleana elliptica* and *Ipomoea sp.* are harvested in the grassland areas of the forest reserves.

In the past, *Ocotea bullata, Alepidea amatymbica* and *Bowiea volubilis* were the most used medicinal products but they have since disappeared from both forests (M. Langa, pers. comm.). They were prepared in many different concoctions by traditional healers (Plate 3.3) to treat a wide range of diseases. They were also popular amongst the commercial gatherers who sold them in the 'muti' markets, such as Durban and Pietermaritzburg.

The improvement of roads surrounding the forests has increased medicinal plant harvesting, by attracting more villagers who see this as an alternative way of surviving. For instance, five years ago there were not more than 15 gatherers in the whole Centocow community but there are currently 30 reported gatherers. Before the road construction, commercial gatherers were transported once a month and would sometimes resort to other means of transport if the usual transport did not turn up (V. Zondi, pers. comm.). In addition, the lack of any control system has encouraged people to turn to medicinal plant trade in the area (M. Langa, pers. comm.). More than fifteen years ago when there was a permit system operating, no commercial gatherers existed (if there were any they were not known by the community members).

Table 3.1: Current and Formally harvested indigenous plants from within and around GSF and KSF

Vernecular	Species name	Family	Use	Part(s) used	Status	LOCATION
unukani	*Ocotea bullata*	LAURACEA	Medicine	Bark	Past	GSF
umaphipha	*Sideroxylon inerme*	SAPOTACEA	Medicine	Bark	Past	GSF/KSF
ikhatazo	*Alepidia amatymbica*	APIACEAE	Medicine	Bulb	Current	GSF/KSF
undiyazi	*Bersama sp.*	MELIANTHACEA	Medicine	Bark	Current	GSF/KSF
umduba	*Combretum sp.*	COMBRETACEA	Medicine	Bark	Current	GSF/KSF
umnyamempunzi	*Plectranthus grallatus*	LAMIACEAE	Medicine	Roots	Past	GSF/KSF
ummemez'omhlophe	*Calodendrum capense*	RUTACEAE	Medicine	Bark	Current	GSF/KSF
ummemezo'obomvu	*Cassipourea sp.*	RHIZOPHORACEAE	Medicine	Bark	Current	GSF
umthunyelelwa	*Pleurostylia capensis*	CELASTRACEAE	Medicine	Bark	Past	GSF/KSF
umzani	*Vepris lanceolata*	RUTACEAE	Medicine Fuel Fence Carve	Bark Stem Branches	Current	GSF/KSF
umvuvu	*Celtis africana*	ALMACEAE	Medicine Fuel Fence Carve	Bark Stem Branches	Current	GSF/KSF
umsonti	*Podocarpus africana*	PODOCARPACAE	Medicine Fuel Fence Build	Bark Stem Branches	Current	GSF/KSF
umthathi	*Ptaeroxylon obliquum*	PTAEROXYLACEAE	Medicine Fuel Fence Build Carve	Bark Stem Branches	Current	GSF/KSF
umkhoba	*Podocarpus latifolia*	PODOCARPACAE	Medicine Fuel Fence Build	Bark Stem Branches	Current	GSF/KSF
inyanzngom'elimnyama	*Prunus africana*	ROSACEAE	Medicine	Bark	Past	GSF
isibhaku	*Ochna holstii*	OCHNACEAE	Medicine	Bark	Past	GSF/KSF
usithuntu\umbomvane	*Ochna natalitia*	OCHNACEAE	Medicine Fuel Carve	Bark Stem Branches	Past	GSF/KSF
undwendwe-lengcuka	not identified	NOT IDENTIFIED	Medicine	Bark	Past	GSF/KSF
umlahleni	*Curtusia dentata*	CORNACEAE	Medicine	Bark	Past	GSF/KSF
umbesa	*Andrachne ovalis*	EUPHORBIACEAE	Medicine	Bulbs	Current	GSF
ingevu	*Dioscorea sylvatica*	DIOSCOREACEAE	Medicine	Bulbs	Current	GSF/KSF
icimamlilo	*Pentanisia prunelloides*	ACANTHACEAE	Medicine	Bulbs	Current	GSF/KSF
uhlunguhlungu	*Brachylaena elliptica*	ASTERACEAE	Medicine	Bulbs	Current	GSF/KSF
ihlozi\umpungo	*Senecio sp.*	ASTERACEAE	Medicine	Bulbs	Current	GSF/KSF
udakwa	*Dioscorea dregeana*	DIOSCOREACEAE	Medicine	Bulbs	Past	GSF/KSF
igibisile	*Bowiea volubilis*	HYACINTHACEAE	Medicine	Bulbs	Current	GSF
umathunga	*Eucomis autumnalis*	HYACINTHACEAE	Medicine	Bulbs	Current	GSF/KSF
ubhokobhoko	*Maesa lanceolata*	MYRSINACEAE	Build Fence	Stem Branches	Current	GSF/KSF
isiqunga	*Cymbopogon woodii*	POACEAE	Fence	Stem	Current	GSF/KSF
umtimatimane	*Diospyros whyteana*	EBENACEAE	Medical fuel	Stem Branches	Current	GSF/KSF

Vernecular	Species name	Family	Use	Part(s) used	Status	Location
inguduza	*Scilla natalensis*	HYACINTHACEAE	Medicine	Bulbs	Current	GSF/KSF
umayisake	not identified	NOT IDENTIFIED	Medicine	Bulbs	Current	GSF/KSF
inkomankoma	*Pelleae sp.*	ADIANTACEAE	Medicine	Roots	Current	GSF/KSF
isinwazi	*Rhoicissus sp.*	VITACEAE	Medicine	Roots	Past	GSF/KSF
umalala	*Osyridicarpos schimperianus*	SANTALACEAE	Medicine	Roots Branches	Current	GSF/KSF
umwelela	*Tulbaghia alliacea*	ALLIACEA	Medicine	Bulbs	Current	GSF/KSF
ibheka	*Pimpinella caffra*	APIACEAE	Medicine	Roots	Current	GSF
uboqo	*Ipomoea sp.*	CONVOLOULACEAE	Medicine	Bulbs	Current	GSF/KSF
umpikayiboni	not identified	NOT IDENTIFIED	Medicine	Bulbs	Current	GSF/KSF
umdumo	*Ilex mitis var. mitis*	AQUIFOLIACEAE	Medicine	Bark	Current	GSF/KSF
icacane	*Kniphofia uvaria*	ASPHODELACEAE	Medicine	Bulbs	Current	GSF/KSF
incotho	*Boophane disticha*	AMARYLIDACEAE	Medicine	Bulbs	Current	GSF/KSF
umfusamvu	*Pittosporum viridiflorum*	PITTOSPARACEAE	Medicine	Bark	Current	GSF/KSF
umkondweni	*Cryptocarya woodii*	LAURACEAE	Medicine	Bark	Current	GSF/KSF
uvuka-kwabafileyo	*Myrothamnus flabellifolius*	MYROTHAMNACEAE	Medicine	Bark	Current	GSF/KSF
unkungwini	*Crabbea nana*	ACANTHACEAE	Medicine	Bulb	Current	GSF/KSF

Quantity harvested and off-take frequencies

Traditional healers

The quantity of plants harvested by healers was difficult to estimate because the number of healers in the survey area was not known. There is no traditional healers' organisation in the area that would have provided a rough indication of the number of healers registered with them. Various reports (Holdstock 1978; Gelfand 1985; Cunningham 1988) had been made regarding the ratio of indigenous healers to the population but these have not been used for a number of reasons. An estimated number of 42 traditional healers was derived from the attendance lists of eight meetings held with them. These healers harvested from both GSF and KSF.

Traditional healers make an average of 1.90 visits (1.90 ± 0.17 visits, $\bar{x}$ ±1SE, n = 20) per month. The frequency of harvesting by traditional healers is mainly determined by the number of patients per month. Although, over the past years few traditional healers expressed no major changes in their monthly harvesting, seven of the 20 interviewed healers harvested more intensively in December. It is common for each traditional healer to collect an average mass of 12.6 kg (12.6 ± 0.65 kg, $\bar{x}$ ±1SE, n=6) per month or 288 kg per annum. The total mass of plant products harvested was estimated as the product of the number of healers and the average mass harvested and the number of times they visit a forest (see Box 3.1).

INFORMATION BOX 3.1 **Approach Used to Calculate the Quantity of Medicinal Plants harvested Annually by Traditional Healers**		
Number of estimated traditional healers	[A]	42
Average mass of plant material harvested per sack	[B]	12.6kg
Number of visits per month	[C]	1.90
Average mass of plant material harvested per month	[D]=[A x B x C]	1 006kg
Total annual mass harvested by traditional healers	[D]=[C x 12]	12.072 tonnes

Commercial gatherers

There are 30 reported commercial gatherers (all women) living around both the KwaYili and Gxalingenwa forest. They sell their products in the Durban 'muti' markets. All the reported commercial gatherers are from Emasameni, Mpumulwana, Ngxola and Gxalingenwa villages. Their harvest rate is consistent throughout the year and they currently collect 15 species for commercial trading (Table 3.3). They spend up to twenty days a month in and around the forests harvesting different plant materials.

Each gatherer is allowed by the transport owner to load 5 bags with an mean weight of 25 kg (25 ± 0.46 kg, $\bar{x} \pm 1SE$, n=10) on the vehicle transport to the 'muti' market every fort-night, and thus 10 bags per month. Two hundred and fifty kilograms of forest products are therefore harvested from the forest reserves by an individual gatherer per month, and thus 3 000 kg per annum per gatherer. The total mass of plant products harvested by the commercial gatherers was estimated as the product of the number of commercial gatherers multiplied by the average mass harvested (see Box 3.2).

INFORMATION BOX 3.2 Approach Used to Calculate the Quantity of Medicinal Plants Harvested Annually by Commercial gatherers in KSF and GSF		
Reported number of commercial gatherers	[A]	30
Average mass harvested by an individual gatherer	[B]	250 kg
Average mass harvested by commercial gatherers monthly	[C]=[A x B]	7 500 kg
Total annual mass harvested by commercial gatherers	[D]=[C x 12]	90 tonnes

The total mass of indigenous medicinal plant products harvested from GSF and KSF is the sum of the average annual mass harvested by healers plus that harvested by commercial gatherers (see Box 3.3).

INFORMATION BOX 3.3 Approach Used to Calculate Total Quantities of Medicinal Plants from KSF and GSF Annually		
Average annual mass harvested by traditional healers	[A]	12.072 tonnes
Average annual mass harvested by commercial gatherers	[B]	90.00 tonnes
Total quantity harvested by commercial gatherers and healers annually	[C]=[A + B]	102.072 tonnes

Table 3.3: Currently harvested indigenous plants for commercial trade in and around GSF and KSF

SPECIES NAME	PART(S) USED	AVAILABI-LITY	LOCAL PRICE/25 KG	MARKET PRICE@R14/KG	LOCATION
Calodendrum capense	Bark	rare	R25	R 350	GSF/KSF
Ipomoea sp.	Bulbs	rare	R25	R 350	GSF/KSF
Ilex mitis var. mitis	Bark	rare	R25	R 350	GSF/KSF
Kniphofia uvaria	Bulbs	rare	R25	R 350	GSF/KSF
Boophane disticha	Bulbs	rare	R25	R 350	GSF/KSF
Pittosporum viridiflorum	Bark	rare	R25	R 350	GSF/KSF
Cryptocarya sp.	Bark	rare	R25	R 350	GSF/KSF
Myrothamnus flabellifolius	Bark	rare	R25	R 350	GSF/KSF
Crabbea nana	Bulbs	rare	R25	R 350	GSF/KSF
Prunus africana	Bark	rare	R25	R 350	GSF
Andrachne ovalis	Bulbs	abundant	R25	R 350	GSF
Scilla natalensis	Bulbs	rare	R25	R 350	GSF/KSF
Tulbaghia alliacea	Bulbs	rare	R25	R 350	GSF/KSF
Brachylaena elliptica	Bulbs	rare	R25	R 350	GSF/KSF
Pentanicia prunelloides	Bulbs	abundant	R25	R 350	GSF/KSF

3.3.2 Building and Fencing Posts

There are six preferred indigenous species harvested for fencing poles (Table 3.4) and building material. Four of these species (Table 3.5) are used for both fencing and house construction while two of them, *Vepris lanceolata* and *Celtis africana*, are used only for fencing. Of note was that posts in the area were only used in the construction of roofs and not in wall construction (Plate 3.4). Women are the principal collectors of poles and building products and are highly selective of the species used. Although the majority of resource users carry the products on their heads, few households (11.7 %) sometimes hire a tractor to transport their wood. The major role played by male resource users is to build a house once the poles are available. Trees are felled using simple tools such as axes and bow saws. When a tree has a large diameter, it is first burnt at the base (Plate 3.5) for few a days (normally up to five days) before it is felled. Some of these trees usually fall in heavy winds. The average volume of a single pole that the local timber wholesale and the mission supplies to the rural people is 0.011m³ (diameter = 3-5cm, length = 3 m) for fencing and 0.041m³ (diameter = 8-10cm, length = 4.5 m long) for building.

Table 3.4: Common preferred fencing (ranked) plant resources in GSF and KSF

FAMILY	SPECIES NAME	VERNACULAR	PART(S) USED	LOCATION
PODOCARPACEAE	*Podocarpus falcatus*	umsonti	stem	GSF/KSF
PTAEROXYLACEAE	*Ptaeroxylon obliquum*	umthathi	stem	GSF/KSF
PODOCARPACEAE	*Podocarpus latifolia*	umkhoba	stem	GSF/KSF
MYRSINACEAE	*Maesa lanceolata*	ubhokobhoko	stem	GSF/KSF
RUTACEAE	*Vepris lanceolata*	umzani	stem	GSF/KSF
ALMACEAE	*Celtis africana*	umvuvu	stem	GSF/KSF
POACEAE	*Cymbopogon sp.*	isiqunga	stem	GSF/KSF

Table 3.5: Common preferred building (ranked) plant resources in GSF and KSF

FAMILY	SPECIES NAME	VERNACULAR	PART(S) USED	LOCATION
PODOCARPACEAE	*Podocarpus falcatus*	umsonti	stem	GSF/KSF
PTAEROXYLACEAE	*Ptaeroxylon obliquum*	umthathi	stem	GSF/KSF
PODOCARPACEAE	*Podocarpus latifolia*	umkhoba	stem	GSF/KSF
MYRSINACEAE	*Maesa lanceolata*	ubhokobhoko	stem	GSF/KSF

Factors influencing resource selection

Availability and durability of species are important and are the overriding factors in the selection of building material in the area. For example, if posts are collected for ceiling beams, highly abundant *P. falcatus* trees with large diameters are selected. Due to a scarcity of standing crop of straight and durable stems (*Maesa lanceolata* and *Ptaeroxylon obliquum*), the large-diameter posts are now being taken from the less durable timber of *P. falcatus*. The same size of trees is also chosen for fencing posts. Posts of *P. falcatus* are also preferred because when cut, they split easily, dry quickly, and maintain straightness.

Off-take frequency

It was evident after the interviews that on average, the mean number of years that a single household would build a new house is once every four years (4 ± 0.43 years, $\bar{x} \pm 1SE$, n = 15). The mean number of years that a single house hold would fence a garden was, however, once every 2.25 years (2.25 ± 0.29 years, $\bar{x} \pm 1SE$, n = 20).

Although stock piling of posts is generally monthly, major harvesting for building materials takes place during winter, especially in June and July. Seventy eight percent of the resource users (n=36) harvested building products in June and July (Fig. 3.1). During the period between May and August, builders spent their time cutting and transporting the wood posts. This is due to the fact that during the June/July period, thatching grass is mature and readily available for harvesting. This is also probably due to the fact that among many various annual activities, this is the only period villagers can have time to build. During the course of the year, villagers are engaged in fencing of the fields and gardens (September), ploughing immediately in October, planting in November and harvesting in February.

Immediately after August, most villagers start fencing their gardens. Sixty percent of the resource users (n=23) harvested fencing products in September (Fig. 3.2). It is apparent that gardens are fenced once every two years and this is the situation when relatively less durable products (e.g posts of *P. falcatus*)are used. Posts of *Ptaeroxylon obliquum* were seen in gardens and are believed to have been standing for more than fifty years (M. Langa, pers. comm.).

Volume harvested

With the help of the local councillor, it was established that during 1997, 34 households in the four villages of Mpumulwana, Emasameni, Endodeni and Endulini built new houses. Of those new houses, 21 (i.e nine at Mpumulwana village, seven at Emasameni and five at Endodeni) were built from indigenous resource products. The average number of posts used in roof construction is 29.73 per house (29.73 ± 1.03 posts, $\bar{x} \pm$ 1SE, n =15). These include the center pillar and posts used as ceiling beams. The number of posts used are determined by the size of the house built and the desired strength of a ceiling. Hence, the smaller the gaps between the posts the more firm the ceiling will be. *Maesa lanceolata* is generally the most preferred and desired species for a pillar.

This model is, however, over-simplified as it does not consider the posts that are used to replace rotting roof posts in already existing structures. However, since it was evident from the survey that households were not only using the forest products for fencing and building, but also wattle plantation products, it could not be assumed that all the products harvested were from the indigenous forest. Forty seven percent of the resource users (282 households) in the sample area harvest building, fencing and fuelwood products from KSF, while the rest (53 %) harvest from other available exotic forest resources.

Figure 3.1: Active harvesting periods for building material (n=36)

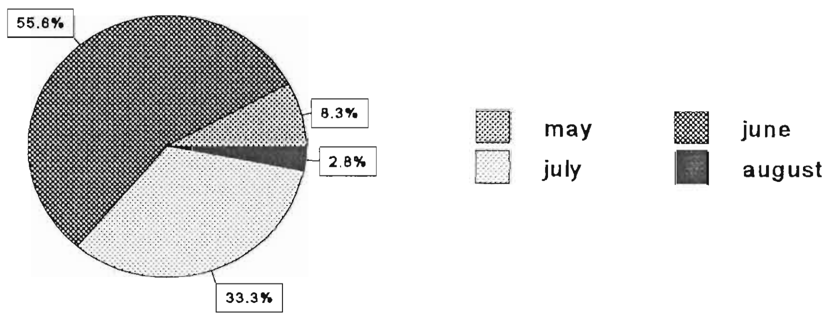
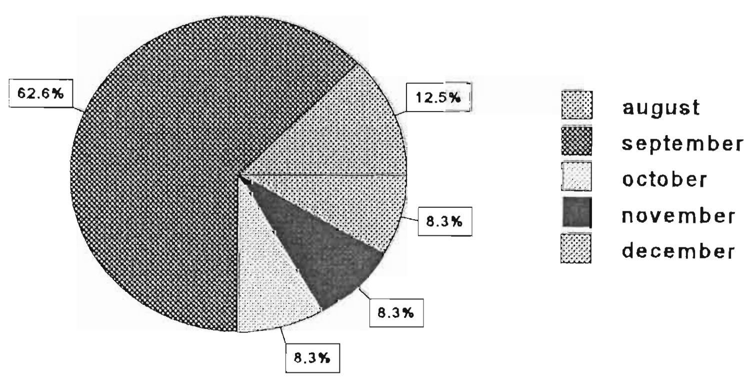


Figure 3.2: The most active harvesting periods for fencing



The total number of posts harvested from KSF was taken as the product of the number of households multiplied by the average number of posts harvested by an individual household divided by four years. The total number of posts harvested from KSF annually is 2 096, which represents 71 structures built annually (see Box 3.4). The annual total volume harvested by the local villagers in the sampled area was calculated as the total number of posts used annually, multiplied by size a single pole used (0.041 m^3). The total volume of building material removed from KSF is, therefore, 85.936 m^3 per annum.

INFORMATION BOX 3.4 Approach Used to Calculate the Estimated Total number of Building Posts harvested from KSF		
Number of households harvesting from the KSF	[A]	282
Average number of posts used in a single structure	[B]	29.73
Average number of posts harvested over a period of four year	[C]=[A x B]	8 384 posts
Average number of year a households would build a house	[D]	4
Total number of posts harvested annually	[E]=[C / D]	2 096 posts

Although the largest quantity of posts is used in the construction of houses, a further use is for fencing (Plate 3.6). The average number of posts used in fencing of gardens is 34.85 per household (34.85 ± 2.13 posts, $\bar{x} \pm 1SE$, n = 20). The total number of posts harvested from KSF was taken as the product of the number of households (282) multiplied by the average number of posts harvested by an individual household divided by 2 years. The estimated total number of posts harvested from the forest is, therefore, 4 368 per annum (see Box 3.5). This, of course, was taken from an assumption that all villagers had gardens in the sample area. The total volume of material harvested from the KSF is, therefore, 48.048 m^3 per annum.

INFORMATION BOX 3.5 Approach Used to Calculate the Estimated Total Quantity of Fencing Posts Harvested form KSF		
Number of households harvesting from the KSF	[A]	282
Average number of posts used in a single structure	[B]	34.85
Average number of posts harvested over a period of two year	[C]=[A x B]	9 827 posts
Average number of year a households would fence a house	[D]	2.25
Total number of posts harvested annually	[E]=[C / D]	4 368 posts

3.3.3 Fuelwood

Fuelwood harvesting is the most labour intensive process practised in the area. Women are the principal collectors of fuelwood for domestic use, and are highly selective of the species used. Since the villages surrounding the KSF are not situated at equal distances from the forest, KSF is used to a varying extent by the different households. The majority of the villagers travel 1 - 2 km to and from the forests.

Although every woody product can be used for fuel, only eight species are preferred (Table 3.6). Of these, stems of *P. falcatus* are the most preferred for fuelwood because it is light in weight, less smoky and easy to harvest. After these trees are felled, wood can be gathered wet and stockpiled by each household for future use, but, only fuelwood stems with diameters ≥5cm are stock piled (Plate 3.7). When wood is required for urgent use, dry wood from large fallen trees is preferred.

Wood density is, however, considered an important factor in the selection of fuelwood (M. Dlamini pers. comm.). For example, the wood of *Maesa lanceolata* is more dense with high caloric value than *P. falcatus,* but, it is heavier to carry and more difficult to harvest.

Figure 3.6: Common preferred fuelwood (ranked) resources in GSF and KSF

FAMILY	SPECIES NAME	VERNACULAR	PART(S) USED	LOCATION
PODOCARPACEAE	*Podocarpus falcatus*	umsonti	Stem Branches	GSF/KSF
RUTACEAE	*Vepris lanceolata*	umzani	Stem Branches	GSF/KSF
ALMACEAE	*Celtis africana*	umvuvu	Stem Branches	GSF/KSF
PODOCARPACEAE	*Podocarpus latifolia*	umkhoba	Stem Branches	GSF/KSF
OCHNACEAE	*Ochna natalitia*	usithuntu	Stem Branches	GSF/KSF
MYRSINACEAE	*Maesa lanceolata*	ubhokobhoko	Stem Branches	GSF/KSF
EBENACEAE	*Diospyros whyteana*	umtimatimane	Stem Branches	GSF/KSF
NOT IDENTIFIED	*NOT IDENTIFIED*	ukolo	Stem Branches	GSF/KSF

Quantity harvested and Off-take frequencies

Fuelwood constitutes the bulk of wood used by the villagers. Most villagers carry head load bundles (Plate 3.8) while a few villagers sometimes hire a tractor to transport wood. Harvesting continues throughout the year and on average 3.14 times a week (3.14 ± 0.37 times, $\bar{x}$ ± 1SE, n = 53). The winter season and December holidays were periods of greater than normal harvesting frequency (Figure 3.3). The mean weight of head loads harvested from the KSF is 29.8 kg (29.8 ± 1.13 kg, $\bar{x}$ ± 1SE, n = 20). The total mass of fuelwood products harvested by the local community from KSF was 1 372.14 tonnes (see Box 3.6).

INFORMATION BOX 3.6 Approach Used to Calculate the Estimated Total Quantity of Fuelwood harvested by the villagers from KSF		
Number of households harvesting from KSF	[A]	282
Average mass of a bundle	[B]	29.8kg
Average number of visits per week	[C]	3.14
Average mass harvested by a single household per week	[D]=[B x C]	93.57kg
Average mass harvested by villagers from KSF a week	[E]=[A x D]	26 387kg
Total mass of fuelwood harvested from KSF annually	[F]=[E x 52]	1 372.14 ton

3.3.4 Carving

All the wood used for carving in the area are harvested from local indigenous forests (Mr Langa, pers. comm.). There were six reported plant resources used for carving purposes in GSF and KSF (Table 3.6). The most important species was *Ziziphus mucronata*. Sticks, knobkerries, wooden spoons, handles for hoes and axes are produced. The gathering of carving material was very infrequent (M. Langa, pers. comm.). There was no commercial market for handcrafts in the area.

A survey of 20 households showed that an average carved households handcrafts weighed 10.25 kg (10.25 ± 0.29 kg, $\bar{x} \pm$ 1SE). On assumption that these utensils were replaced each year the total mass harvested from KSF per annum by an individual household is calculated at about 6 150 kg by the local population.

Table 3.7: Common preferred carving (ranked) plant resources in GSF and KSF

FAMILY	SPECIES NAME	VERNACULAR	PART(S) USED	LOCATION
RUTACEAE	*Vepris lanceolata*	umzani	Stem	GSF/KSF
ALMACEAE	*Celtis africana*	umvuvu	Stem	GSF/KSF
PTAEROXYLACEAE	*Ptaeroxylon oblquum*	umthathi	Stem	GSF/KSF
OCHNACEAE	*Ochna natalitia*	usithuntu	Stem	GSF/KSF
RHAMNACEAE	*Rhamnus prinoides*	unyenye	Stem	GSF/KSF
RHAMNACEAE	*Ziziphus mucronata*	umphofane	Stem	GSF/KSF

INFORMATION BOX 3.7 Approach Used to Calculate the Estimated Total Quantity of Carving plants harvested from KSF		
Number of households harvesting carving products	[A]	600
Average mass of carving products	[B]	10.25kg
Total annual mass harvested by households	[C]=[A x B]	6150kg

3.4 Discussion

GSF and KSF remain the major suppliers of many products for the well-being of the Centocow community. Households in the area depend on a mix of forest products to meet their basic livelihood needs. Gandar (1983) and Cunningham (1985) have also emphasised the role of indigenous plants in providing many basic needs to rural people for shelter, fuel, medicine and as source of income.

Medicinal plants

Demand

The collection of medicinal plants is exerting an important impact on the natural populations of plants and has led to local extinction of some species (Cunningham 1988a). Recently, a survey of several Durban City medical clinics indicated that 53% of the black clinic patients still made use of traditional healers (Mander 1998). Given the current level of demand for indigenous medicine, the pressure at GSF and KSF for medicinal plants is unlikely to decline. Mander (1998) shows that the demand for medicinal plants exceeds the supply. These impacts are likely to increase with time, affecting both rural self-sufficiency and conservation of biological diversity (Cunningham 1989; Gandar 1983).

Quantities harvested

In Durban, it is estimated that there are about between 7 000 and 8 000 gatherers that service the market and in terms of turnover, the annual trade is estimated to be between 490 tonnes and 730 tonnes in Russel Street and between 250 tonnes and 340 tonnes at Ezimbuzini (Mander 1998). Mander (1998), also estimated that, in Durban, there could be approximately 1 500 full time healers practising and trading over 900 tonnes per annum. The gatherers are clearly responsible for the largest quantity of material traded in Durban. This is reflected very clearly in the study area where commercial gatherers are responsible for 88.1 % of the total medicinal plant products harvested annually from KSF and GSF. These estimates are based on the total number of sacks transported to the market per fort-night. McKean (pers. comm.), estimated an average mass of 23.5 kg per sack of plant material being transported to the Durban markets. This mass is lighter than those estimated in the study area (25 kg/sack).

The improvement of roads have definitely increased the levels of resource harvesting. Du Toit (1984) found that the use of vehicles to transport fuelwood increases in the areas of greatest deforestation.

People involved

In the study area all the reported gatherers are women. Mander (1998) also found that between 80 % to 90 % of the street traders in Durban are women, originating from communal areas.

Fuelwood

The demand

Fuelwood gathered from the forest, woodlands and exotic plantations, for example, accounts for 51 % of the domestic energy used in South Africa (Bason 1987) and represent the biggest consumption of plant biomass (Cunningham 1992). In the study area the quantity of fuelwood gathered from KSF is large for most times of the year, cold winters (June to July), with temperatures ranging between 8 - 10C, are the periods of most intensive fuelwood use and exploitation.

Resource selection

Depending on the specific objectives, fuelwood is known to be selected on the basis of it's ability to provide slow or fast, cool or intense, smoky or smokeless fires (Cunningham 1988). Research in Lesotho has also indicated that a preference for softwood (light in weight), as a source of fuelwood, varied with the abundance and, hence, availability of wood type (Steele & Ncholu 1983; Wickstead 1984). This may explain why an abundant, less smoky and softwood species, such as *P. falcatus,* is an obvious choice fuelwood among the local women.

Frequency of collection

Fuelwood collection in the dry (winter) season and in December is considerably frequent than during the rest of the year. Munzwa (1979) found that in Ndanga (Zaka) Communal land most households (60 %) used two bundles of firewood per week in the summer, but 50 % used three bundles in winter. He ascribed this partly to the fact that people are less occupied with agricultural task in winter and therefore spend time relaxing around a fire, whereas in summer a fire is used almost exclusively for cooking. The more intensive harvesting of fuelwood in winter can also be associated partly to the fact that people spend more time around fire. In December, a fire is used almost exclusively for cooking large meals due to the return of migrant labourers for holidays.

Building and Fencing Posts

The demand and resource selection

In his study, Ruffo (1989) suggests that the quantity of posts needed for a single house is large and their removal from the forest is often a major influence on forest ecology. In KSF and GSF a considerable number of preferred species, such as *P. falcatus* can grow to form tall trees and their regeneration, as well as the whole forest, is threatened under the current harvesting conditions.

The current harvest of large mature trees, such as *P. falcatus,* for posts is due to lack of available straight and more durable trees. Availability may be particularly important where there is a large work-effort associated with harvesting (Muir 1990). Muir (1990) also argues that if under these conditions the availability of an otherwise "ideal" resource species declined, the resource-definition could be expected to shift to include the next most abundant diameter-classes, crooked stems and less durable species. As smaller plants are often more abundant than larger it is reasonable to expect that the woodcutters will concentrate their efforts on harvesting smaller stems before they are forced to cut crooked stems or less durable species. In KSF, more durable species are now rare and would require that the gatherer spend more time searching in sometimes dense and rugged terrain. In addition, *P. falcatus* trees split easily, dry quickly, and maintain straightness when cut and can make excellent but not durable post. This explains why these communities make the use of *P. falcatus*, rather than other more durable species.

Quantities harvested

The volume of posts used annually in the construction of houses is definitely larger than that used in the fencing of gardens. This is despite the fact that the local villagers only use posts in the roof and mud blocks for wall construction. This is the same situation also in other parts of the continent, such as the East Usambara mountain forests in Tanzania (Hamilton 1989). The use of bricks for the construction of walls is an important factor that influences the frequency of pole collection (Du Toit 1984). Despite the fact that households used mud blocks for wall construction which consequently reduced the number of poles required for building, the volume of building posts used in the area still remained larger than that required for fencing.

It is highly probable that the harvesting rates for building material at KSF have only showed a significant rise in the recent past. The majority of the villagers at Emasameni are the survivors of feuding which occurred less than 10 years ago in the area leaving many of them homeless. Du Toit (1984) found in his study area in Zimbabwe that, of households that have been in residence for under 10 years, the proportion that collects construction poles once or more in 4 years is significantly greater than the equivalent proportion of households that have been in residence for over 10 years. Judging from the above, it is reasonable to suggest that, villagers at Emasameni had a major effect regarding the frequency at which households build new houses in the area.

The use of indigenous plants for crafts has a value of using renewable resource, generating income and preserving traditional culture (Cunningham 1992). In the rural environment where many people are poor, commercialised products could promote high resource use and consequently high impacts on the forests. The lack of a commercial market for handcrafts in the study area decreases the impact of resource use in GSF and KSF. However, the subsistence use of carving products ensures the preservation of local traditional culture, such as carrying of sticks by men, especially in traditional gatherings.

Conclusion

Even though huge amounts of plant material are removed from the GSF and KSF, these forests still remain the major sources of wood and medicine to the majority of the local villagers. An important feature of the use of the KSF is the removal of firewood for domestic use. The high rate of medicinal plant use from the forests is exacerbated by commercial exploitation for selling in the huge 'muti' markets. At the present rate of use many useful resources will disappear, many people will be negatively affected and biological diversity will drop. The protection of these forests is vital, not only because when fully recovered they will be a source of many products essential to the well-being of many rural households throughout the Centocow, but because they protect catchment basins of the Mzimkhulu river on which the majority of people are dependent on.

Plate 3.1: Traditional healers, commercial gatherers and social workers from the Centocow area

Plate 3.2: Bulbs of *Scilla natalensis* from GSF and KSF that are sold at the traditional medicine markets

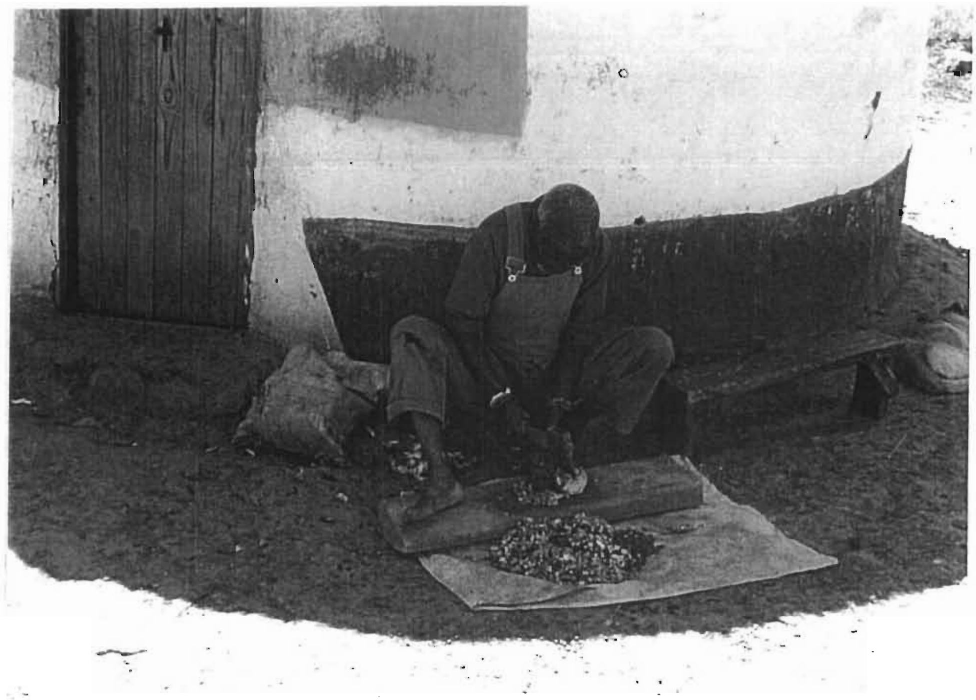


Plate 3.3: A local healer preparing a concoction from various medicinal plants harvested from GSF and KSF.

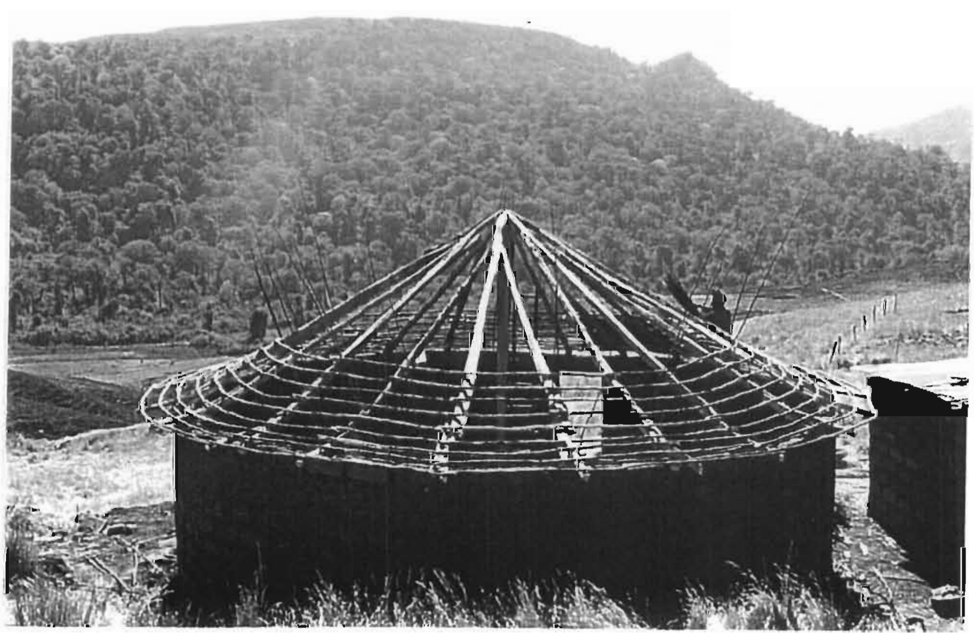


Plate 3.4: Roof of a local structure constructed using posts from *Podocarpus falcatus* stems

Plate 3.5: A *Podocarpus falcatus* tree burnt at the base before being felled

Plate 3.6: Local vegetable garden fenced with indigenous material

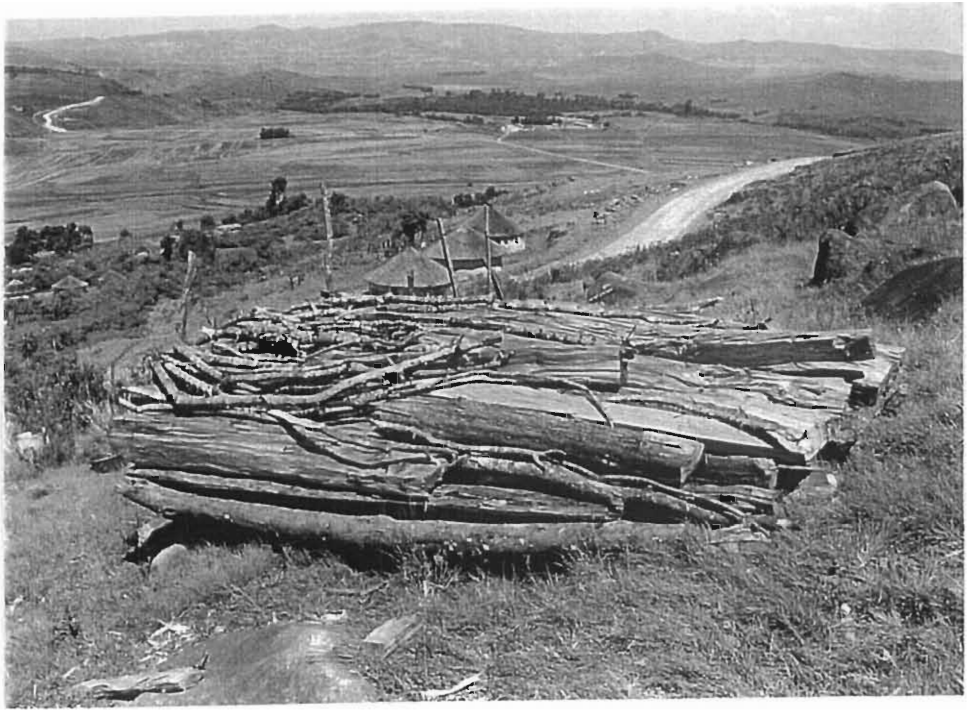


Plate 3.7: A stockpile of indigenous products for future fuelwood usage

Plate 3.8: A headload of fuelwood harvested during each visit to the forest

CHAPTER FOUR

ECONOMIC VALUATION OF FOREST RESOURCES TO RURAL HOUSEHOLDS IN THE CENTOCOW AREA

4.1 Introduction

Resources from indigenous forests are important to the economy and welfare of rural communities. Forests provide the essential material for various commodities, such as medicine, fuelwood, construction poles, food and handcrafts. Increasing population density and concordant increase in demand for forest products has resulted in a rate of use that is not sustainable. An understanding of the use of forest resources and their economic value is imperative for developing mechanisms that will balance the supply with the demand in a sustainable manner. In this chapter the direct value of forest resources to rural households with the aim of demonstrating the economic benefits of conserving Gxalingenwa and KwaYili forest is discussed.

The total economic value of natural and environmental resources can be disaggregated into use and non-use values (Georgiou *et al.*, 1997; Pearce, 1991). Use values can be broken down into direct use, indirect use and option values. Ethical and aesthetic values are non-use values. Direct use values are derived when an individual makes actual use of a facility. Indirect use values arise from the natural functioning of ecosystems, for example storm protection by trees, flood control by wetlands and nutrient cycles (Georgiou *et al.*, 1997). Option value is an individual's or society's willingness to pay for the option of using an asset at some future date (Georgiou *et al.*, 1997). The overall significance of natural areas based on these categories, is potentially immense, but is rarely taken into account by economists and environmentalists.

Assessing the direct value of forest resources does not preclude making a later evaluation of their indirect use, and aesthetic or ethical values (Martin, 1995). These different assessments of economic worth can later be evaluated to gauge the total economic value of forests. However, the process of calculating overall value is relatively new in economics (Martin, 1995), so the methods are still experimental and not well established or universally accepted.

In this chapter the direct use value of the forest resources to the rural households, instead of the total economic value is assessed. Since the indigenous forest resources in the two forests are harvested for both commercial and subsistence purposes, alternative values are used for non-commercialised products.

In South Africa, the population-resource problem had been compounded by past State apartheid policies (Timberlake, 1988; Cock, 1990; Durning, 1990), which ensured an authoritarian conservation approach that neglected the needs and aspirations of the majority of rural communities. With new policies in place and different more holistic conservation strategies adopted, it is evident that the conservation problems can no longer be solved without considering the economic status of the rural poor. Attempts to protect forest stands therefore need to be located in a framework that seeks solutions to broader socio-economic problems (Eckholm *et al.*, 1984; Harrison, 1987; Leach & Mearns, 1988; Munslow, 1988) rather than only focussing on; conservation.

An understanding of the relationship between forest use and socio-economic differentiation is critical to a full understanding of the dynamics of forest change (Campbell, 1996). There are studies which support the view that socio-economic differentiation leads to significant differences in plant resource use and value. This study, however, does not evaluate the in-depth relationship between forest resource use and socio-economic differentiation, but later in the chapter, an indication of the demography of the resource users is given. This is useful as it aids forest managers to understand the dynamics of the resource users when making decisions.

4.2 Methodology used in valuing products

Values were all calculated based on local people's perceptions and values rather that those of urban-orientated economists and conservationists. Despite the fact that using the local known subsidised prices would appear to underestimate the value of the forest products, this is how the local people really value products from the indigenous forests. Plant resources were first divided into commercial and subsistence use categories. The values of forest products to rural households were taken as a product of the quantities harvested multiplied by the selling price. After obtaining the quantities and the frequencies of use of products harvested, prices were then determined. For medicinal products local and market prices of the harvested material were used. However, because there was no commercial market in the Centocow area for fuelwood, carving, fencing and building material, prices were derived from the next best substitutable options.

In this study the local, the market and replacement values are presented. Local values are those values found in rural markets or proxies of rural values (M. Mander, pers. comm.). Replacement values are those values derived from the next best substitute option, should services derived from the forest not be available anymore. Values used in this study are, therefore, a fair representation of the direct use of products derived from the forests.

The focus on direct value was because these are the more tangible uses of forest products. The values used here, unlike those in Campbell *et al.* (1995a), have not been decreased by subtracting labour costs and expenditures involved in extraction. For example, the money earned from medicinal plant products by commercial gatherers is considered to be a net-income since the gatherers have transport costs but this ignores the time and energy that goes into collecting material.

Valuation techniques used

Medicinal products

A distinction was made between the use of products by healers and commercial gatherers. Values used in this category were a mix of local prices and market prices. It was difficult to assign a price per kilogram used by the traditional healers as their charges were not only based on products harvested, but also on their services. Due to the latter problem market prices were used to calculate the market value of the products (Mander, 1998). A structured questionnaire was, however, also used to estimate healers average monthly income (products and services). The local prices used by commercial gatherers were used to calculate the local value of the medicinal products to the gatherers. These local prices (R 1/kg) were far below the market prices and obviously underestimated the value of forest products. In this case estimates of the value of raw products harvested were based on both the local prices and market prices.

In his survey of the Durban ‘muti’ markets, Mander (1998) calculated that an average price of raw products at the ‘muti’ market was R14/kg. This value, was used as the average economic value of products gathered from the forests.

The local value (C) of medicinal plants to healers and gatherers was calculated to be the product (A) of the quantity of the resources harvested multiplied by the local price (B) of the resources. [C = (A x B)]. The replacement value (F) of the same quantity of resources was taken as the quantity (D) of the resources multiplied by the market price (E). [F = (D x E)]. Due to the transport costs (R 200/month) paid by commercial gatherers to the markets, these where deducted from both gatherers’ market and local value (M. Lawes, pers. comm).

Building and Fencing Posts

Posts from the indigenous forests are an important low-cost building and fencing material in the area. In the absence of a local value for posts harvested in the indigenous forests, a next alternative value was used. Untreated poles from the local Roman Catholic Mission plantations were sold for R3.00 each for house building and R1.00 each for fencing. The mission prices are not market based and would therefore underestimated the value of the same resource from the indigenous forests (M. Mander, pers. comm.).

These subsidised prices are designed to promote the community development purposes. Should these subsidised resources become unavailable, local people would have to buy them expensively on the market. Despite this, the value of the mission plantations products were on the eyes of the local people equal to the value of the indigenous forests. Mission wattle pole prices were taken as the next best substitutable options and represent the replacement value of the indigenous forest posts to the local people. An average market price for an untreated building pole was R12.00 and R3.00 for a fencing pole. These two market prices were taken as the best substitutable options and represent the replacement costs[1] of the indigenous forest posts should the subsidised mission products become unavailable. Both the mission prices and market-based prices were used to calculate the replacement value of the forest products.

The replacement value (C) for building a house roof and fencing a garden from the forest products was estimated to be the product of the average quantity of the posts used (A) and the alternative price of the posts (B). C = (A x B). However, because each household would build a house once over a period of four years, the estimated value was taken to be the amount of benefit a single household would receive from KSF over the same period. Similarly, because each household would fence a garden once over a period of 27 months, the estimated value was taken to be the benefit a single household receives from the forests over the same period. This provided an estimated amount of money a household would save over a given period, and thus per annum, if they aspire to build a new house.

Fuelwood

The local value of a fuelwood bundle was taken to be the value of the next alternative headload of fuelwood. Even though the prices of the used headloads varied according to size, a standard price for an average sized headload was used. The Roman Catholic Mission supplies the majority of the community members with wattle products at R0.15 a bundle. Private local wattle forest owners in the area were selling a headload of fuelwood for R2.50, which was equal to the market prices. Despite the low subsidised prices from the mission, both prices (R0.15 and R2.50) were used as the most next substitutable costs of the same mass of fuelwood from the indigenous forest. These were the only known costs to the local people and represented the replacement value of the indigenous forest posts should they become unavailable. Using a structured questionnaire it was found that the villagers harvest 3.14 times a week. The mass of a headload was taken as an average mass of 20 weighed headloads.

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[1]Costs based on alternative nearest timber wholesale prices

The replacement value (C) of fuelwood from the indigenous forests was estimated to be the product of the average mass harvested (A) and the next alternative price (B). C = A x B.

Carving

There was neither a local value nor a next alternative value of carving products in the area. It was clear after a focus group discussion that in the eyes of the local people handcrafts products were not for any commercial purpose but for subsistence use. There were actually cultural values assigned to some of the products, e.g sticks and knobkerries, which be economical evaluated. Due to these reasons the economic values for handcrafts were not calculated.

4.3 Results

4.3.1 The value of forest products to rural households

Medicinal products

The total replacement value of KSF and GSF to the local traditional healers is R 168 920.64 per annum (see Information Box 4.1). On average traditional healers earned R 4 032 per annum (n = 42), or R 336 per month. This figure accords with the range of R 250 and R 500 (n =20) that the majority (80 %) of local traditional healers said they earned a month. This average monthly value does not include the healer's consultation fee charge.

INFORMATION BOX 4.1 Approach Used to Calculate the Value of Medicinal plants to the Traditional Healers		
Average annual mass harvested by a healer	[A]	287.94 kg
Average market price of raw products	[B]	R 14/kg
Number of traditional healers	[C]	42
Average annual use value of medicinal plants to a healer	[D]=[A x B]	R 4 031.16
Total annual use value of medicinal plants to healers	**[E]=[D x C]**	**R 168 920.64**

From chapter three it was evident that each commercial gatherer harvests an average 250 kg a month, and thus 3 000 kg per annum. The total local value of medicinal plants to commercial gatherers was R600 per annum per gatherer and the market value was, however, R 39 600 per month per gatherer (see Box 4.2). The overall market value (C) of medicinal plants is, therefore, the sum of the total market value of the products harvested by the healers (R 168 920.64) plus market value of those harvested by gatherers (R 1 188 000). [C = R 1 356 920.64].

INFORMATION BOX 4.2 Approach Used to Calculate the Value of Medicinal plants to the Commercial Gatherers		
Average annual mass harvested by a single gatherer	[A]	3 000 kg
Average market price of raw products	[B]	R 14/kg
Number of commercial gatherers	[C]	30
Annual transport cost to the Durban 'muti' markets per gatherer	[D]	R 2 400
Average annual market value of medicinal plants per gatherer	[E]=[(A x B)-D]	R 39 600
Average local price of raw products	[F]	R 1/kg
Average annual local value of medicinal plants per gatherers	[G]= [(A x F)-D]	R 600
Total annual local value of medicinal plants to gatherers	[H]=[G x C]	**R 18 000**
Total annual market value of medicinal plants to gatherers	[I]=[E x C]	**R 1 188 000**

Building and Fencing Posts

Given an average number of 29.73 poles used in the roof of a house, over a period of 4 years, it would cost a single household R 356.76 to pay for those poles from the market (see information 4.2) and R 89.19 from the mission. Therefore indigenous poles have a replacement value of R 89.19 and a market value of R 356.76. Because each household builds a house once over a period of four years, the alternative value was taken to be the amount households spend over the same period. A single household, therefore, benefits from the forests an average market value of R 89.19 or R22.30 (replacement value) per annum. From section 3.2.2 it was evident that the total number of posts harvested from KSF annually is 2 096. The villagers in the sample area, therefore, benefit to a replacement value of R 6 288 and market value of R 25 152 from the forest per annum. The 21 households that built new houses, in 1997 (624.33

posts), benefited to a replacement value of R 1 872.99 and market value of R7 491.96 in material harvested from KSF.

INFORMATION BOX 4.3 **Approach Used to Calculate the Value of Building Posts to the local community**		
Total number posts harvested annually by the community	[A]	2 096
Average market price of building posts	[B]	R 12/posts
Average replacement price of building posts	[C]	R 3/posts
Total annual market value of building posts to the local community	[D]=[A x B]	**R 25 152**
Total annual replacement value of building posts to the local community	[E]=[A x C]	**R 6 288**

The fencing of gardens also turned out to be cost effective for villagers. Given that the average number of posts removed from the KSF per annum is 4 368 (section 3.2.2), and that it cost R 1 (mission price) and R 3 (market price) to replace a single post, the average total replacement value and market value of fencing products to the villagers is R 4 368 and R13 104 respectively (see Box 4.4). The average replacement value to a single household for fencing a garden is R15.49 per annum and the market value of the same products is R 46.47.

INFORMATION BOX 4.4 **Approach Used to Calculate the Value of Fencing posts to the local community**		
Total number of posts harvested annually by the community	[A]	4368
Average market price of fencing posts	[B]	R 3/posts
Average replacement price of fencing posts	[C]	R 1/posts
Total annual market value of fencing posts to the local community	[C]= [A x B]	**R 13 104**
Total annual replacement value of fencing posts to the local community		**R 4 368**

Fuelwood

From the surveys it was found that on average a household gathers fuelwood 3.14 times a week (3.14 ± 0.37, $\bar{x}$ ± 1SE,, n=53) amounting to a total of 93.57 kg/week (section 3.2.3). This is equivalent to 4 865.64 kg per household per annum. Given that the next alternative products are sold for R 0.08/kg (private owner's price) and R0.005/kg (mission price), the replacement values for 4 865.64 kg of fuelwood harvested by a single household annually is R 374.40 and R 24.49 respectively. Following this approach, the total replacement value of fuelwood from KSF to the villagers (282 households) is R109 771.18 (from private owners) and R 6 860.69 (from the mission) per annum. However, because both the mission and privately owned products are perceived as replacement products by the local villagers, the average of the two values was taken as a real replacement value of fuelwood (R 56 243.69).

INFORMATION BOX 4.5 Approach Used to Calculate the Value of Fuelwood to the Local Community		
Average annual mass harvested by local community	[A]	1 372.14 tonnes
Average alternative replacement price of fuelwood(private owners)	[B]	R 0.08/kg
Average alternative replacement price of fuelwood (mission)	[C]	R 0.005/kg
Total annual replacement value of fuelwood to the local community (mission)	[C]=[A x B]	**R 6 860. 69**
Total annual replacement value of fuelwood to the local community (private owners)	[C]=[A x B]	**R 109 771.18**

4.3.2 The Total value of forest products

The local total quantities and value of indigenous forest products to the villagers in the sampled area per annum are summarised in Table 4.1. Medicinal plant products yield the highest direct value to the local villagers and are followed by fuelwood products. Also evident was that there was no commercial activity (no replacement value) for carving products and people only used them purely for subsistence purposes.

Table 4.1: Quantities and Total Value of forest products used by the local community per annum

PRODUCT	RESOURCE BASE	No. of households / people	QUANTITIES (Kg / posts)	REPLACEMENT & LOCAL (L) VALUE(Rands per annum)	MARKET VALUES (Rands per annum)
FUELWOOD	KSF	282 households	1 372.14 ton	R 56 243.69	Nil
MEDICINE	GSF & KSF	72 people	102 .096 ton	R 18 000 (L)	R 1 356 920.64
BUILDING	KSF	282 households	2 096 posts	R 6 288	R 25 152
FENCING	KSF	282 households	4 368 posts	R 4 368	R 13 104
TOTAL				R 84 899,69	R 1 395 176.64

4.3.3 Socio-economic indicators of the resource users

In chapter three, it was evident that households in the sampled villages benefited from collecting forest products from GSF or KSF. This section will focus on the findings based on interviews with 60 resource users in the sample area. The resource users represent a diverse group, with a wide variety of social and economic characteristics.

Figures are presented to indicate the range of resource user characteristics in the local community. This has important implications for the forest use potential and can provide a way forward for forest managers. The majority (93%) of indigenous resource users in the area are women (Fig. 4.1). Men (7%) who are involved in harvesting are mostly herdboys (Plate 10) and traditional healers. Villagers between the age of 26 and 45 are the most active resource users (Fig. 4.2).

Figure 4.1: The gender of the resource users (n=60)

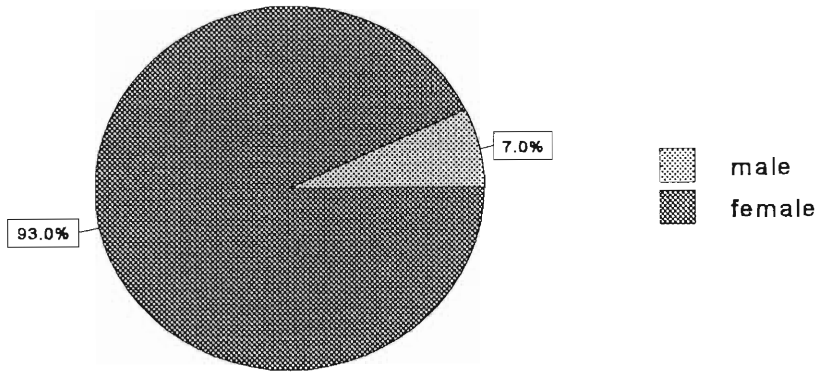
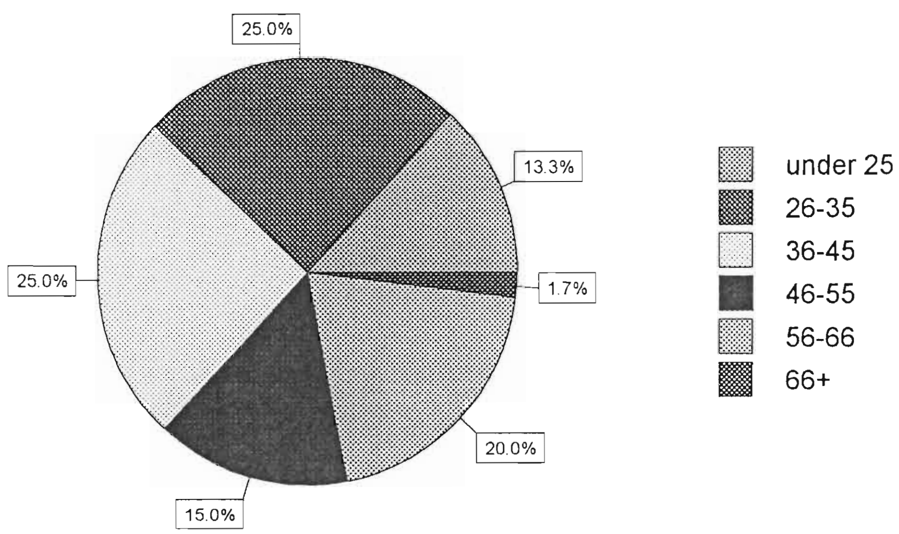
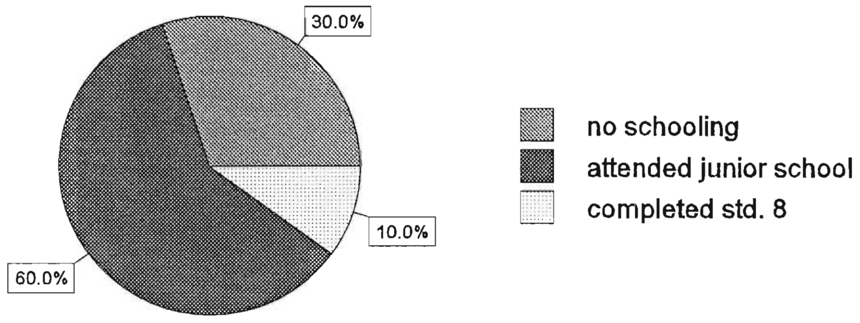


Figure 4.2: An indication of the age of resource users (n=60)



Sixty percent of the resource users have at least attended junior secondary school and 10% have completed Standard 8 (Figure 4.3). Of the 60 interviewed resource users, none had matriculation or diploma certificate.

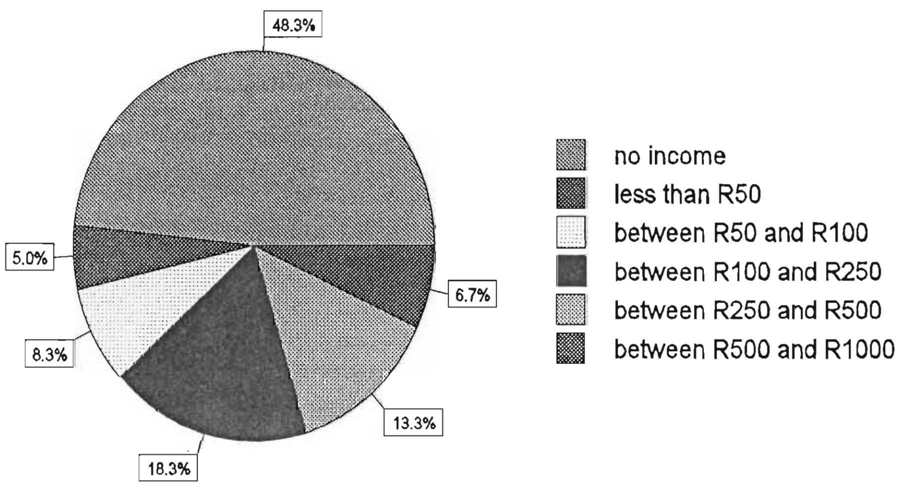
Figure 4.3: The education level of resource users (n=60)

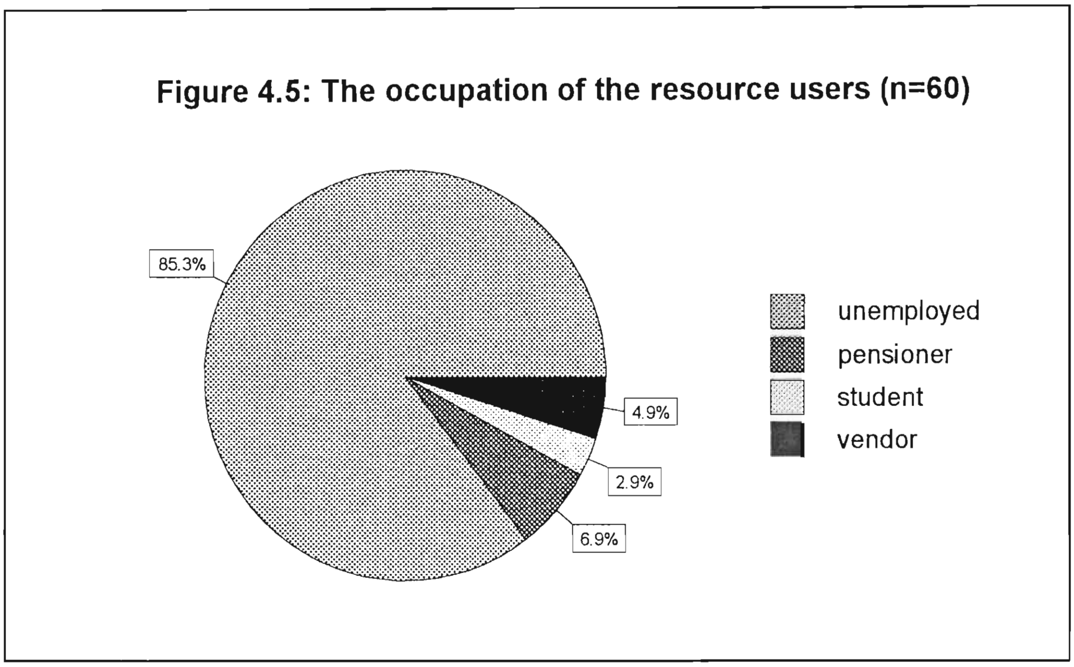


Members of the community with a higher education level were not involved in forest resource harvesting.

There is a wide range of incomes earned by the resource users (Fig. 4.4). The majority (48%) of the resource users do not earn any money while (45%) earn less than R250 per month. This is also reflected by the high rate of unemployment (Fig. 4.5).

Figure 4.4: Resource users' income per month (n=60)





Although the majority of the resource users do not earn an income, 40% of all the users receive monies from other sources. They receive money from either spouses, children and other family members who work locally or as migrant labourers.

4.4 Discussion

Medicinal plant trade by traditional healers and commercial gatherers represents a significant income generating activity in a few households in the local community. It has grown out of local expertise and is based on locally available resources. With the annual market value[2] of over one million rand, medicinal plant products represents the highest benefit that local villagers could derive from GSF and KSF. However, a one-to-one comparison showed that the price per kilogram of medicinal plants sold at the 'muti' market by the gatherers is very cheap to those sold to consumers in the same area (by the street traders, healers and shop traders)[3]. In

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[2]Value of local products based on Durban 'muti' market value

[3]The majority of these people live in the 'muti' markets for weeks and buy most of their products from the rural gatherers

his study in the Durban 'muti' market Mander (1998), found that urban market products were more expensive than that of the rural market products. This places the local gatherers even at a worst scenario since they do not even have a formal rural market but trade as individuals in a huge urban market. The gatherers are allowed to sell their products in bags (R 1/kg) which the market traders would sell to consumers in smaller units (R 14/kg). The total market value of medicinal products is clearly more than the local value, implying that the commercial gatherers are not harnessing the full potential of their forest products.

Mander (1998) associated the purchasing of large volumes by street traders with aggressive bargaining. This can also be attributed to huge competition amongst the various plant gatherers at the market (M. Mander, pers. comm.). For example, rural women in northern KwaZulu-Natal now travel into Mozambique to buy *Warburgia salutaris* bark as local stocks are depleted, creating competition with the Mozambican gatherers who may be selling to South Africa. Such competition inevitably forces the price to go down. Squeezed between the high transport costs (R 200 a month) and low prices (R 250 a month) which the traders from the markets pay for the products, it is fair to say that the commercial gatherers are desperate to earn money and not that concerned about saving the forests. This is totally different from traditional healers whose primary concern is to provide health services at reasonable prices while also saving the available forest resources for future use. However, while the amounts earned by healers and commercial gatherers may represent a relatively small percentage of the average wages in South Africa, it nevertheless represents a significant income in a rural environment.

The dichotonomy between economic value assigned by the poor and by richer people is an area of continuous discussion in the socioeconomic literature (Hassan *et al.* 1997). Despite the urban-based perspectives of the forest value, it was evident that, the real value of the forests to the rural people is the value of the locally available product, such as mission plantation products. A comparison between the replacement values and the formal market values yielded some interesting results. For example, the difference between building material sold locally (R3) and that sold at the market (R12) was 400 %. It could have even been more if the transport costs of going to the formal markets were included. The subsidised local values could mean several things to the local villagers and conservationists.

- that it is not worth saving the forests since there are affordable alternative resources should the forest resources become unavailable. There are therefore no incentives for conserving the forests.
- that subsidised plantation products are taking away pressure from the forest since they are affordable to the local villagers.
- that should both the forest and subsidised alternative resource become unavailable, the cost that the local villagers would bare would be unaffordable. There is therefore incentive to conserve the forests which would encourage the local villagers to after them.

There are, however, other values that were not considered in this study, such as stream-flow regulation and the forests role in supporting livestock. The total value of GSF and KSF to the local villagers is probably an underestimate, especially when considering the fact that aesthetic and ethical values have also not been included.

Forest resource benefits and socio-economic status

Despite alternative wattle products for building, fencing and fuelwood available at the Roman Catholic Mission and private wattle forest owners, many people in the sample area are still harvesting from the KSF. This can be attributed, partly, to high unemployment levels, low education standards, plant resource quality considerations and long return trips to these local sources. It was clear during a focus group with few a resource users that the little money they earn, either from forest product sales or pension funds, is expended on food and children's education. The fact that the majority of resource users are women suggests that women harvest a greater variety of species than men and are aware of more uses of the individual plant species than men do. It is therefore fair to assume that KSF and GSF have a greater use value for women than for men.

Given the income, education levels and the generic high level of unemployment of the rural households living in Centocow, it is fair to suggest that in order to ensure effective management of KSF and GSF, the socio-economic aspects of the rural people should always used as a guide and as a sound basis for any future conservation plans.

4.5 Conclusion

It became apparent that the incentives of saving the forest are enormous for both subsistence and commercial purposes. The benefits derived by the commercial gatherers are not worthwhile if one considers the destruction caused as a result of removing medicinal products from the forests. However, if the market value of these products is considered, there are enormous economic benefits that could be derived from medicinal plant products. High economic benefits could however result in an opportunity scramble for scarce forest resources which can result in over-exploitation of already depleted resources. The non-commercialised products from the forests have a high market value which could also result in an opportunity scrabble should the local people realise it. The benefits derived will be lost and the poor will become poorer. However, depending on the positive developmental changes (job creation) in the area, the demand for these resources could be expected to decrease in future. The current situation is therefore indicative of a need for new management strategies if the benefits from these forests are to be sustained.

CHAPTER FIVE

THE ABUNDANCE AND SIZE CLASS DISTRIBUTION OF SELECTED HIGH-VALUE PLANT SPECIES IN THE FORESTS KWAYILI AND HLABENI

5.1 Introduction

Patches of forest with Afromontane floristic affinities occur along the mountain chains from Northern province through Swaziland and KwaZulu-Natal to the Western Cape. Floristically the Afromontane element is dominant but Pondoland-Tongaland forest species may be common in the Eastern Cape and KwaZulu-Natal (Low & Rebelo, 1996). Cooper (1985) categorised KwaYili State Forest (KSF) and Hlabeni State Forest (HSF), along with other Afromontane Mistbelt Mixed *Podocarpus* in KwaZulu-Natal as better examples of this forest-type. Over-exploitation, especially the massive extraction of timber during the colonial period, has led to considerable reduction in size of many of these forests in KwaZulu-Natal forests (McCracken, 1987). Fourcade (1889) recounts that local tribes used the forests for sheltering their cattle during winter, and poles were cut for hut-building purposes. These activities were stopped, but illegal cutting of poles, laths and sticks continued.

Both KSF and HSF have several species that are sought after by local communities (such as *Podocarpus falcatus*, *Podocarpus latifolius*, *Celtis africana*, *Ptaeroxylon obliquum* and *Calodendrum capense)*. The recent exploitation of KSF by the local community has placed future survival of these species, and thus the forest in jeopardy. KSF is currently under intensive exploitation for building and fencing posts, medicinal plants and firewood (see previous chapters). The shift in recent years from sustainable use of medicinal plants by traditional healers to the over-exploitation by profit-orientated gatherers has resulted in the local extinction of species such as *Ocotea bullata* that were once common (M. Langa, pers. comm.). Such unsustainable levels of exploitation and lack of forest management could soon drive more high-value species into extinction. However, except for the massive destruction of the forests for timber that occurred after the arrival of the Europeans in KwaZulu-Natal (McCracken, 1987), HSF has remained well protected since its proclamation as a state forest in 1892.

Understanding the dynamics of the plant community in natural forests is critical for the effective management, use and conservation of forests. Generally, in KSF and HSF, there is little information about the population dynamics of indigenous plant species, the rate of off-take frequency and what levels of harvesting are suitable under different conditions. Consequently, protection of the resource requires that harvesting rates are initially set at conservative levels and that numbers in the population are continually monitored to ensure that abundance does not drop below a critical threshold (Muir, 1990). The circumstances at KSF prompted the need to determine the current density and size-class distribution structure of the most heavily harvested species within forest. The assumption was that by understanding the character of the size-class distribution, the density of available harvestable material would be determined (Harper, 1977). Two tree species *Podocarpus falcatus* and *Calodendrun capense* were selected for more detailed study.

Calodendrum capense was selected because it is currently the most debarked medicinal plant species from KSF. The current high rate of bark removal of *C. capense* is driven by a huge demand from the 'muti' markets in Durban. *P. falcatus,* however, is harvested for multiple purposes, such as building, fencing and firewood, and was chosen for because it is currently the most used species in these categories. *P. falcatus* is preferred by villagers because it is light, easy to cut, dries quickly and gives less smoke than other species when burnt.

5.2 Methods

Mbewe (1997) identified four reasons that restricts the removal of resource from a protected area. These are:

(i) accessibility

(ii) location of settlements in the vicinity of the forest

(iii) forest topography and

(iv) local knowledge.

For example, local people prefer to harvest resources that are easily accessible. Consequently, the most heavily exploited forest areas are those close to settlements and are without rugged topography. This causes uneven levels of exploitation in different areas of the forest. Given these considerations, the ideal strategy for determining the densities of plant species is to stratify the forest into the heavily and lightly exploited areas. Extraction levels at KSF, however, were high throughout the forest and plots were randomly placed.

In this chapter, the density of standing and harvested *P. falcatus* and *C. capense* trees at KSF (exploited), and their size-class distribution profiles are investigated. The availability of different sizes of both species are also discussed. In order to evaluate the extent of exploitation, size structure frequency distributions were determined for forests under exploitation and those least or not exploited. An assumption was that the past disturbance history of these two forests was the same. Also, assumed was that the physical conditions influencing growth, germination, establishment are the same between the forests.

Plant sampling method

Whittaker plots (Schmida, 1964; Fig. 5.1) were used to determine the density of *P. falcatus* and *C. capense* in KSF and HSF. Thirty sampling plots (20m x 10m) were established in each forest. Seedlings (below 0.50 m) were counted within the 1.25 x 2.5 m subplots while diameter of saplings (between 0.5 m and 1.5 m tall) were estimated in the 2.5 x 5 m. Diameter (dbh) of trees between 1.5 m and more or less the height of the forest canopy were measured within the 5 x 10 m subplots. All the trees that were not falling under the first three subplots and above the canopy height were sampled within the 20m x 10m plot. Members of the local community assisted with the identification of trees (standing and stumps). Prior to data collection the sampling techniques were demonstrated to these helpers. Tree height and the stem diameter at breast height (dbh) were recorded for all individuals with a dbh greater than 5cm. Individuals with dbh less than 5cm diameter were counted. *C. capense* stems with evidence of bark removal were counted and measured. Stem diameters of cut stumps were measured as close to the cut as possible. Where swelling of the stem or lifting of the bark had resulted from cutting damage, the diameter was measured below that distortion.

Trees were classified into 17 diameter size-classes. For C. capense the smallest class was 0.5 cm and for the largest class considered trees larger than 80 cm. Intervening classes all had equal intervals of 5 cm. For *P. falcatus* the smallest class comprised trees within 0-10 cm while the largest class considered those above 160 cm. Intervening classes had equal intervals of 10 cm. Data collected from the forests under two different utilisation pressures; exploited (KSF) and unexploited (HSF) were used to draw the size-class frequency distribution tables in order to determine the population profile of *C. capense* and *P. falcatus* species in these forests. Kolmogorov-Smirnov test (Siegel & Castellan, 1988) were used to test for differences in stem and stump density in the different size classes.

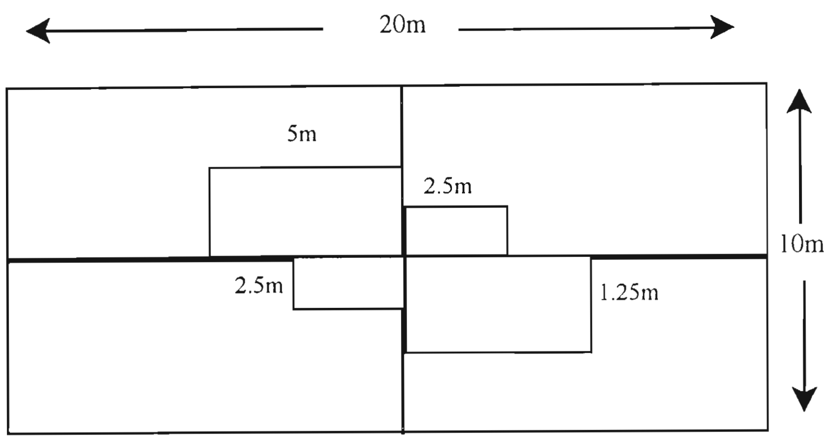

Figure 5.1: Diagram showing the sampling techniques used in KSF and HSF.

5.3 Results

5.3.1 Size-Class Distribution Profile

Podocarpus falcatus

The stem diameter size class distributions of *P. falcatus* in KSF are illustrated in Figure 5.2. There was a decrease in the density of stems per hectare as the diameter size-classes increases. The highest density (527 per hectare) was noted in the 0-10 cm class which were mainly seedlings. All the seedlings were found in shaded areas under the canopy. Appreciable quantities of trees were observed in the large sized dbh classes indicating the forest was in its mature stage. For instance 15 and 10 trees per hectare were observed in the 110-120 cm and 120-130 cm respectively. Of note was the paucity of stems in the medium-sized dbh classses which could be attributed to harvesting.

A comparison of tree density, within the 17 size-classes, showed that the two forests (KSF and HSF) have different population (stem) distribution profile ($D_{574,38}$= 0.438, $p < 0.01$) (Fig. 5.2). A huge difference was observed in the lowest dbh class 0-10 cm. Unlike in KSF, where few stems were observed, HSF had a fairly even distribution of stems in the medium-sized classes. However, KSF had more stems in the very large classes (between 90-100 cm and >160 cm) compared to GSF. No stumps were observed in HSF indicating little or no harvesting. However, at KSF large sized stumps were evident (Fig.5.3).

Calodendrum capense

The diameter size class distributions of *C. capense* at KSF is shown in Figure 5.4. Like, *P. falcatus* the density of stems per hectare decrease as the diameter size classes increase. *C. capense* had a low density of stems in the medium and large dbh classes, but were more abundant at the dbh class 0-5cm with 17 stems per hectare. This is a typical inverse-J-type of growth distribution (Harper, 1977; Silvertown, 1982). *Calodendrum capense* stems were found growing along the forest edges with most seedlings and saplings found in open gaps.

A comparison of the stem distributions in HSF (unexploited) and in KSF (exploited) showed that there were differences in the tree population profile between the forests ($D_{27,38}$ = 0,637, $P< 0.01$) (Fig. 5.4). Stem distribution at KSF showed a higher density of seedlings and saplings than HSF, however, HSF had a higher density of trees.

No stumps were recorded in HSF indicating little or no harvesting. All the stumps observed at KSF were in the low and intermediate size classes, with dbh class 5-10 cm showing the highest stump density (8 stumps per hectare)(Fig. 5.5).

Bark removal was noted in both forests. At KSF bark removal was noted in four dbh classes (5-10, 70-80, 80-90 and above 90cm) and in one dbh class at HSF (above 80cm). If the size range within which debarking occurs is put into consideration, it is likely that a higher quantity of bark

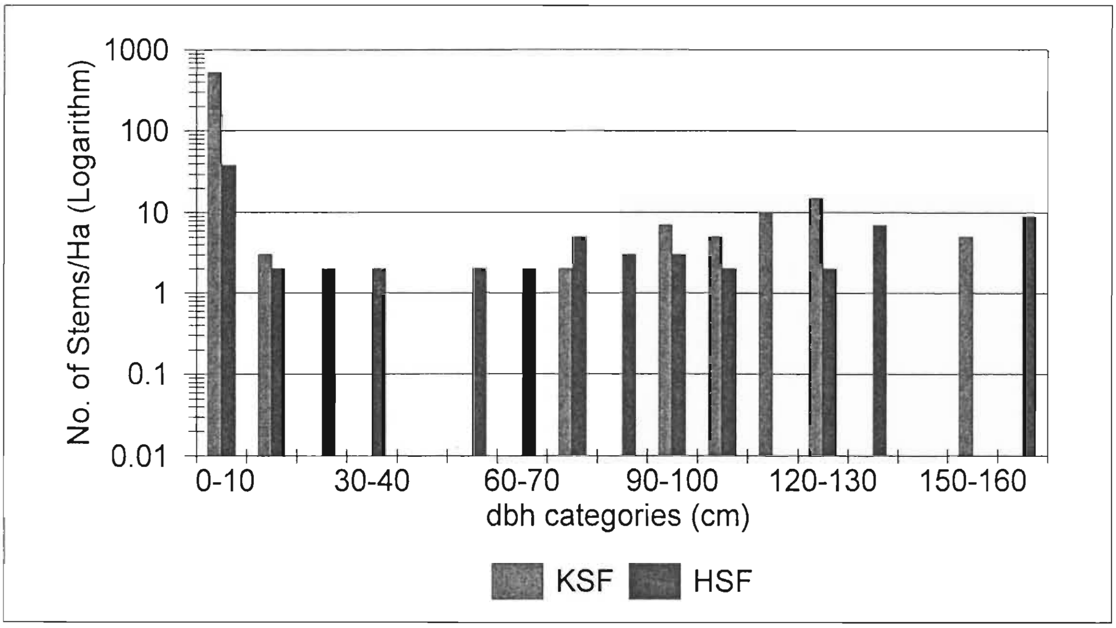

Figure 5.2: Size-class distribution of *Podocarpus falcatus* in KwaYili (exploited) and Hlabeni State (unexploited) Forests

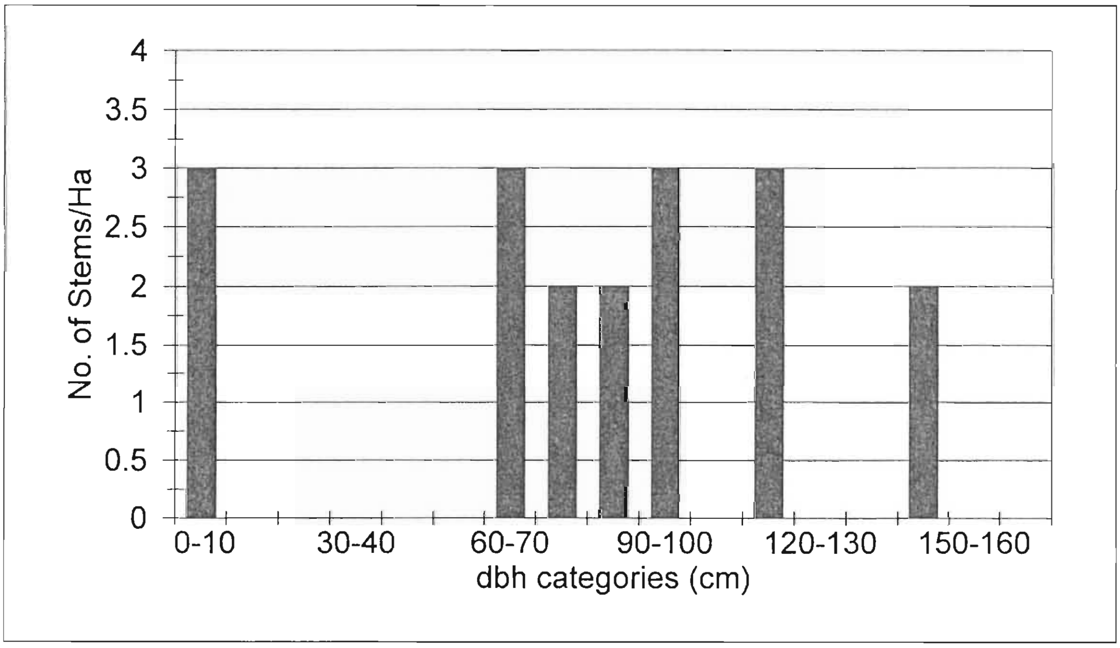

Figure 5.3: Stump size distribution of *Podocarpus falcatus* in KwaYili State Forest

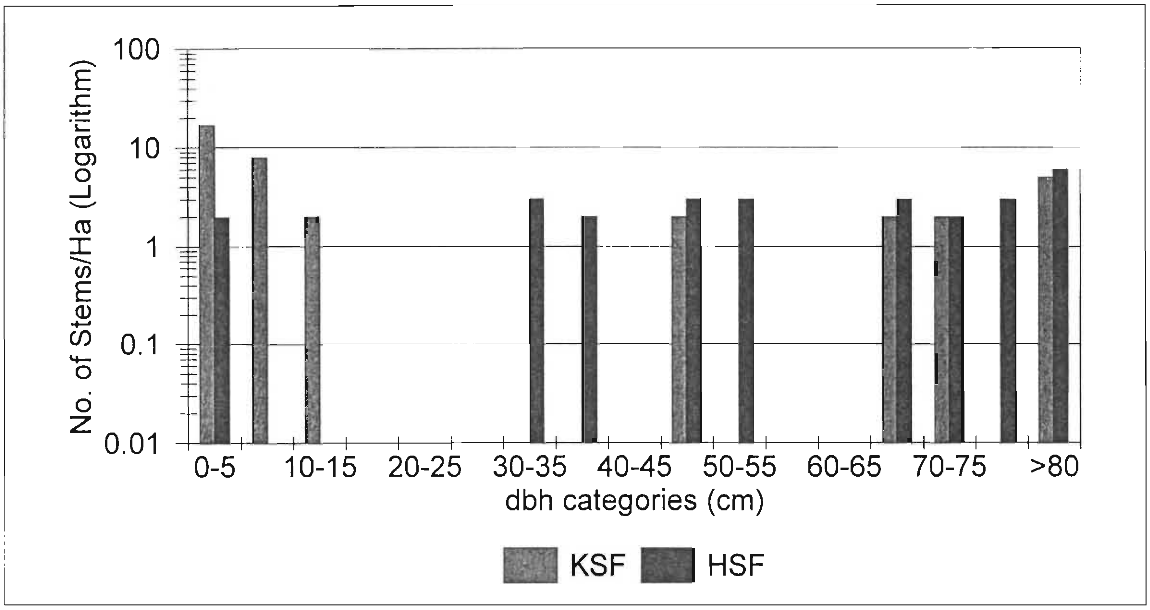

Figure 5.4: Size-class distribution of *Calodendrum capense* in KwaYili (exploited) and Hlabeni State (unexploited) Forests

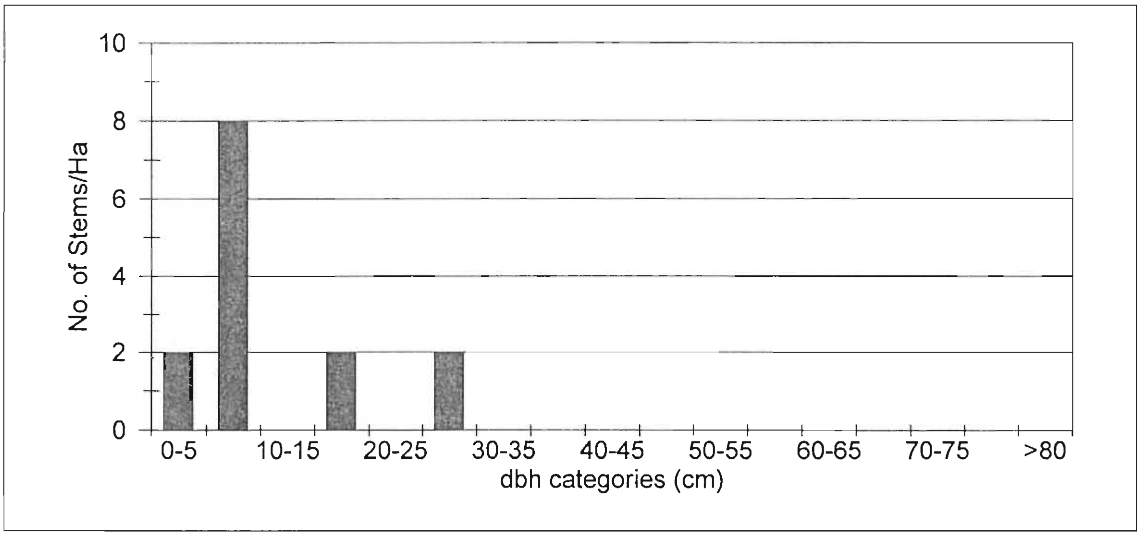

Figure 5.5: Stump size distribution of *Calodendrum capense* in KwaYili State Forest

was removed at KSF than at HSF. The extensive debarking seen at KSF is caused mainly by commercial gatherers who are driven by a huge demand from the 'muti' (traditional medicinal) markets.

5.3.2 Comparison of Resource Availability and Harvesting at KSF

The use of the forest resources and the need to optimize the benefits to the local community requires an understanding on the resource use levels. Indices comparing harvesting with the resource availability for *P. falcatus* over certain period is described in table 5.1. The index is defined as a ratio of (A) the accumulated number of cut stumps to remaining harvestable stems (stumps plus harvestable stems). Because the stems remain *in situ* as they decompose, they present the best indication of earlier harvest levels accumulated over years.

Similarly the number of harvestable stems reflects accumulated years of growth required for stems to reach harvestable size (Muir, 1990).

Indices contrasting tree availability to harvesting varied from 0 to 1.0. Most size-classes registered an indice of zero indicating no harvesting while others showed 100 % harvesting and thus had indices of 1.00. Apart from the 140-150 cm class, all size-classes above 90 cm had indices below 0.3.

In order to develop a resource use model for *P. falcatus* at KSF, it is preferable to compare annual harvesting intensity with annual stem availability (Muir, 1990). However, it is difficult to assess the age of cut stems with any accuracy. There was no available information on decomposition rates of stumps. Although harvesting rates were established (refer to section 3.3), lack of data on growth rates of stems and recruitment from coppices hindered information on stem availability. All this information is important in enabling direct comparison of the accumulated harvest with the accumulated resource. There is therefore a need to establish permanent sample plots (PSP) and collection of this data to develop a (Muir, 1990) dynamic resource modelling system for KSF.

Table 5.1: Indices comparing stem availability and harvesting of various diameter classes at KSF. The index is expressed as a ratio (A:C) of cut stumps (A) to the number of accumulated harvestable stems (cut stumps plus harvestable stems-C)

Diameter class	No. of Stumps/ha (A)	Trees/ha. (B)	Stumps + Trees/ha (C)	Index (A/C)
0-10	3	527	530	0.01
10-20	0	3	3	0.00
20-30	0	0	0	0.00
30-40	0	0	0	0.00
40-50	0	0	0	0.00
50-60	0	0	0	0.00
60-70	3	0	3	1.00
70-80	2	2	4	0.50
80-90	2	0	2	1.00
90-100	3	7	10	0.30
100-110	0	5	5	0.00
110-120	3	10	13	0.23
120-130	0	15	15	0.00
130-140	0	0	0	0.00
140-150	2	0	2	1.00
150-160	0	5	5	0.00
>160	0	0	0	0.00

5.4 Discussion

Size-Class Distribution and Resource Availability

The use of size-class distributions can give an indication of the age of individuals in the population and whether there is a reasonable rate of recruitment (Mbewe, 1997). When compared with stump distribution or bark removal distribution patterns it can give a clear indication of which size-classes are exploited. The variation in density and size also has an implication on the use of the plant resource by local villagers (Mbewe, 1997) and are important in the development of both general and species-specific resource management recommendations for KSF.

Although *P. falcatus* at HSF and KSF had more seedlings and saplings than large trees they did not show an inverse-J-type of growth distribution. Inverse 'J' distributions are mostly common in undisturbed forests (Everard *et al.*, 1995) and indicate high stability in the forest structure or minimum levels of disturbance in a forest. Forests that deviate from this distribution would indicate some form of disturbances. In many forests of Natal Midlands, heavy exploitation primarily due European woodcutters in the nineteenth century has been reported (McCracken, 1987). In HSF, van Wyk and Everard (1993) have reported tree exploitation which could patly explain the current lack of stems in the medium sized-classes and the observed deviation from inverse-J distribution in KSF.

Despite the fact that KSF is currently more exploited than HSF, more seedlings were evident in the former. This is most likely due to shady conditions available in KSF as it was dominated by shrubs that have encroached into it following human disturbances. *Podocarpus falcatus* is a shade-tolerant species (Midgley, 1992) and the shrubs such as *Maesa lanceolata* and *Diospyros whyteana* form a conducive environment for seedling regeneration. A further analysis of the high density of seedlings and saplings in certain areas in the KSF could be particularly significant for future research both in terms of understanding the maintenance of such high population sizes when compared to HSF and for future controlled harvesting purposes.

The low density of stems and high number of stumps in the dbh classes above 10cm may indicate the former harvesting of this species by the local villagers. Stump size distribution shows that trees in the large size-classes 90-100 and 110-120 cm are the most desired and exploited. Stem of trees from these classes are split into post, that are used for construction and fuelwood purposes (refer to subsection 3.3.2 and 3.3.3 respectively). Although there are *Eucalyptus grandis* and *Acacia mearnsii* plantations in the area, products available within their areas, *P. falcatus* is preferred because, (i) it is freely available; (ii) it is lighter to carry; (iii) it emits less smoke and therefore suitable for indoor cooking. The other factor may be that KSF is closer to many local community members.

As most seedlings of *P. falcatus* were observed growing under the canopy, the tree can be interpreted to be a shade tolerant species. An abundance of shade-tolerant species in a forest would indicate a fine-grained species (Everard *et al.*, 1995). Forest communities with sub-canopies that are very similar in species composition to the canopy and have seedlings and saplings in larger numbers than trees indicate that recruitment to the canopy is occurring from advanced regeneration (Everard *et al.*, 1995). In such forests the turnover of stems is, therefore, occurring on a small scale and the forest can be interpreted as being fine-grained. Such a structure was evident at KSF where *P. falcatus* could be considered a fine-grained species.

Unlike other canopy dominants in KSF, such as *P. falcatus, C. capense* conforms to the inverse-J size-class distribution. In KSF, *C. capense* had seedlings and saplings in larger numbers than trees indicating high stability. A species that shows this distribution can be assumed to be shade-tolerant since it is able to regenerate under shade. In KSF, *C. capense* was mainly observed growing along the forest edges and in open shrub-lands which suggest it is a shade-intolerant species with a good recruitment level. Since the *C. capense* at KSF has an inverse-J size-class distribution and dominates the canopy and sub-canopy, it can be assume to be fine-grained.

Although stumps were only recorded at low and intermediate dbh classes, bark removal was mainly on large dbh classes. Bark from large *C. capense* trees is sought after by both commercial gatherers and traditional healers (M Langa, pers.comm.). Although large trees with thick bark appears the most preferred, thin bark from young trees is also harvested and has been seen at the Durban 'mufti' markets (M. Myles, pers. comm.). The stumps observed at low dbh classes (0-5 and 5-10 cm) were probably used as poles, since young trees of *C. capense* have straight stems which are desirable for construction purposes.

5.5 Conclusion

Both KwaYili and Hlabeni are important Afromontane Mistbelt Mixed *Podocarpus* forests in KwaZulu-Natal which have provided and still provide (KSF) timber and non-timber products to the local people of Centocow area. In this chapter, the size-class distribution of *Podocarpus falcatus* and *Calodendrum capense* were outlined and their availability quantified. *Podocarpus falcatus* was more threatened as it was heavily exploited yet showed a poor regeneration of medium sized trees. Its regeneration did not clearly conform to the inverse-J distribution as a result of the exploitation. However, *C. capense* showed inverse-J distribution and its abundance in both canopy and sub-canopy indicated a fine-grained structure. Given the current high exploitation of *P. falcatus* and its poor regeneration state observed in KSF there is a need to develop a management plan that should particularly advocate harvesting control measures.

CHAPTER SIX
GENERAL CONCLUSIONS AND RECOMMENDATIONS

6.1 General Conclusions

Forest products are harvested at an unsustainable rate from Gxalingenwa and KwaYili forests and no serious attempt has been made to manage the forests on a sustainable level. It is also recognised by the majority of the community members living in Centocow that forests are the main source of supply of both subsistence and commercial products used in construction, carving and traditional medicine. A single household benefits from the forest products (fuelwood, building and fencing) a total average replacement value of R 310.93 per annum. An extra benefit is also received by those who use the services of local traditional healers. Unemployment is an important factor that will have a direct bearing on the survival of indigenous forests and the urgent need for land-use planning in Centocow area.

Large *Podocarpus falcatus* trees proved to be the most harvested species for many purposes: fuelwood, building and fencing. The overwhelming preference for this species by the local people threatens its future survival. At the present rate of use, they will disappear and, indeed, this is evident at KSF, where a large area (about one hectare) is covered in stumps of this species.

Bark removal from *Calodendrum capense* was not severe at KSF. However, large amounts of bark of this species together with other medicinal plants were transported to the Durban 'muti' markets. This is achieved by bark from small trees (5-10 cm) and large trees (70-80, 80-90 and above 90 cm). Furthermore, the harvesting of *Calodendrum capense* for poles (0-5 and 5-10 cm) is a threat to its survival.

The protection of KSF and GSF is vital, not only because they are a source of income and supply essential products for the well-being of the rural community, but they also protect the catchments of the Umzimkulu river, which supplies the community with water. Cooper (1985) further argues that because of the limited areas they occupy, the indigenous forests of South

Africa are so important that every area should automatically be granted blanket conservation status. The indigenous forests must be wisely managed for the short and long-term benefit of biodiversity and people. The ecology of GSF and KSF is unknown. This pilot study at KSF shows that this forest is experiencing ongoing disturbance and destruction. Its future is, therefore, insecure.

Effective and feasible management strategies for the sustainable use of GSF and KSF are sorely needed. In developing these it should be borne in mind that the local poor villagers are the most dependent on these resources, and stand to lose most by denial of access to them, or by depletion of the resource. Consequently such strategies should lead to the generation of employment for the local villagers, not their further marginalisation. The critical question is therefore: "what should be done to save the forests given their status and the dependence of local people on them?"

6.2 Recommendations

6.2.1 Encourage the planting of trees

There is always a problem in selecting an appropriate tree species to fulfill a specified function (Raintree and Hoskins, 1988). This can be partly attributed to lack of communication between the planters and the intended resource users. For example, the majority of villagers in the area prefer *Acacia mearnsii* to *Eucalyptus grandis*. *E. grandis* was reported to be more smoky when burned than *A. mearnsii*. *A. mearnsii* is also seen as multi-functional, and almost everyone who is not using indigenous forest products, uses wattle poles for building houses and fencing.

The Rural Afforestation Project is encouraged to promote the planting of trees for a variety of purposes besides the provision of fuel and poles. Although a drive to increase planting of a range of valued or particularly hardy non-eucalyptus species would do little to directly solve the problems of supplying fuel and construction wood, it could be of major indirect value in raising people's awareness of their ability to replace trees in the rural areas (Du Toit, 1984).

In order to ensure that the benefits of planted trees go to members of the communities who need them most, plantations will have to be located in areas that are as near to them as possible. Past plantations were too far from villagers of Endodeni and Emasameni who supposedly use the most indigenous forest products. Villagers in Endodeni and Emasameni have no alternative exotic woodlots, and only a few households in Mpumulwana have privately owned wattle trees. Any tree plantation should be in an area where it will be central to these three villages and there should be an agreement with interested local villagers first.

An area adjacent to KSF which KZNNCS and some local people earmarked for tree planting, is an area that some villagers see as a good cultivatable land (M. Khumalo, per. comm.). In Lesotho almost all the land put forward by villagers fell into Bawden and Carrol's (1968) "unsuitable for agriculture" category and was viewed by the project managers as unsuitable for grazing (Bruce, 1989). A firm agreement between the plant growers and local community will have to first be reached before any planting can take place.

6.2.2 Medicinal plant gardens as an economic and conservation solution

Raintree and Hoskins (1988) point out that fruit trees, fodder, medicinal plants or poles for cash income, among numerous other uses of trees, often take precedence in rural communities. Over forty years ago, Gerstner (1946) proposed the cultivation of medicinal plants, and singled out the pepper-bark tree, *Warburgia salutaris* as one of the trees most in need for cultivation. No action was taken and this tree is now considered endangered in South Africa (Cunningham, 1990c). Encouragingly, since Gerstner's (1946) work, partnerships have developed in addressing resource management problems and loss of rural self-sufficiency through "conservation by cultivation" initiatives, both for medicinal plants and crafts. Durban Municipality's Silverglen Medicinal Plant Nursery (since 1982) and HL & Mining Timber, for example, are interacting with herbalists to facilitate cultivation of favoured species such as *Warburgia salutaris* (Nichols, 1990).

During their training, the healers are encouraged to start their own local medicinal plant garden. Such a herbal garden, could lead to a community-based reserve that will be large enough to cater for the needs of the majority of the villagers. The involvement of local people in planning and running the reserve will provide small-scale employment and training, while still permitting limited exploitation of medicinal plants from the indigenous forests. Mander (1998) showed in his recent work at the Durban 'muti' markets that a significant number of people depend on the medicinal plant trade for their livelihood. Similarly medicinal gardens at Centocow could be economically viable, reducing the need to harvest from the indigenous forests.

To date medicinal plant gardens have met with little success. The few that have been established do not address the major problem of medicinal plant gatherers (which is monetary). These gardens are usually small, poorly irrigated with inadequate plant materials, which in most cases do not germinate and do not meet the demand. The gardens may address the needs of a few traditional healers, but they do not meet the needs of the commercial gatherers. Therefore, for these gardens to succeed they should be on good cultivatable land, relatively large, properly managed and business orientated.

It is apparent that the major goal of both traditional healers and commercial gatherers is to earn money from forest products and that conservation comes second. There is a risk that gardens may alter the demand on indigenous products and alter the values and utility of resources. Conservation agencies should consider this in promoting the use of gardens.

6.2.3 The role of Forest Conservation Agencies in conservation of the forests

As already mentioned it is the local community itself which must play the principal role in forest conservation programmes but at the same time government agencies will have to make important contributions. A firm commitment by the government to conservation programmes and a continuing involvement of the various services concerned is thus essential if any major break-through is to be obtained (FAO, 1978). During this research, it was evident that if conservation of indigenous forests is to be realised, a supportive institutional environment in which community forestry programmes can take place is critical. The incentives which motivate these different groups may also be different and may even conflict rather than complementary and supportive (FAO, 1985). Given the above facts and the past mistrust between rural people and forest conservation agencies, these programmes may require a sympathetic co-ordination amongst rural people, foresters and others involved in the implementation.

Historically, forest conservation agencies have been the organisations responsible for implementing forestry programmes. Characteristically, except for policing and protection, they have had little communication with rural people. Forest managers are gradually acknowledging the consequences of poor interaction and are becoming more socially responsive. Consequently, new holistic policies which give effect to innovative and far-reaching programmes with communities near the protected forests are being formulated by forest agencies. Communication is, therfore, fundamental in order to facilitate interaction and partnership between all parties active in or interested in the programmes and to generate broad-based recognition for the programmes. The change in forest conservation policy should also be effectively practised by extension officers on a continual bases.

A major constraint in most extension activities is the difficulty of getting agents to really listen to rural people, take what they say seriously and work with them. The tendency in many extension services is to stress the transmission of a 'technical package' from the agent to the rural people (FAO, 1986). Despite great emphasis on collaboration with rural people, most extension officers still believe and assume they know more about the forests and forest conservation than the rural villagers. Even if a clear institutional frame-work is developed at an executive level, if extension officers are not co-operative and not well trained, it will be difficult to implement the policy, and consequently little will be achieved. From the perspective of a rural person, who knows a great deal about his physical surroundings, social and political limitations, any imposed 'package' by a extension officer may often seem irrelevant and ill-considered. However, it is also important that systems are structured so that effective extension workers know that they will be, and in fact are, appreciated, supported and rewarded.

- The conservation officials should start adapting their objectives and operation programmes more specifically towards community development. This might need staff reinforcement so that continuous contact can be maintained with the rural villagers.

- The conservation officials should then start having regular and meaningful contact with communities and be able to offer them tangible help and advice (conservation related) when necessary.
- When a common understanding is developed, the local people should be incorporated in any agroforestry decision- making process. Traditional healers are respected by the local people and are sometimes community leaders. Having such stake holders in the decision making body could put more weight, and thus respect for decisions among local communities.
- A full-time staff should be appointed jointly by the tribal authority and the state whose responsibility it would be to check constantly on GSF, KSF and other southern KwaZulu-Natal forests to ensure that these forests are not being mismanaged or destroyed.
- First priority should be given to the local people when the appointment of guards is made. Having local people guarding the forest and, involved in decision making processes will ensure the respect of any decision taken and thus the sustainable use of forests resources. Employment of local people will not just ensure sustainable use of forest resources but will boost their economic stability.
- A permit system should be re-introduced. It should, however, be affordable and easily accessible. The guards that will be monitoring the forests should be responsible for issuing out of permits. This is, however, a very difficult issue and would need proper management.
- The local authority should be informed about any developments at all times for they represent villagers in the area.
- Because of the social (rather than conservation) requirements that sometimes go along with forest extension work, a careful coordination of the various ministries (e.g. Agriculture for gardens) and formal consultation arrangements will be necessary. The responsibilities of the government ministries should be clearly defined and that the agency entrusted with implementation of the programme has the full authority.

6.2.4 Education and Training

The major problem among rural people is a lack of awareness or understanding of the importance of indigenous forest. Educational programmes must be designed to penetrate the existing distorted perceptions of conservation and sustainable use. Silverglen Nature Reserve is currently the only place that provides training for traditional healers on propagation and cultivation techniques. Such programmes could benefit those who wish to initiate their own medicinal gardens, either individually or communally. During this research programme cultivation and propagation techniques training for 18 traditional healers at Silverglen Nature Reserve was facilitated. Training for commercial gatherers is also necessary because they have proved to be the major users of the natural reserves in the area for medicinal plants.

Due to involvement of school children in the harvesting of forest products, conservation programmes should not only focus on elderly people but be introduced in the surrounding schools. The formation of environmental clubs in schools is one feasible way forward to sustain environmental programmes therein. Also, because of the rapid disappearance of traditional knowledge and cultural change in rural communities, education programmes for scholars will be an excellent idea. As a tool to attract more participants, awareness programmes among the rural people that conservation is a powerful means of preserving their culture can also be used. Education and training are therefore the keys to combat over exploitation of forest resources - not merely legislation and law enforcement.

6.2.5 Future research

From the above conclusions and recommendations on issues of utmost importance concerning the conservation of GSF and KSF, it is apparent that a detailed assessment is required on the ways in which local people and rural organisation could be instrumental in tree planting and conservation activities. Some specific points for consideration in a community-level survey are:

- what attention has already been given by community bodies to local deforestation problems;

- whether local organisations feel that they could be involved in afforestation, or if community organisations are willing to take a leading role in tree planting, the nature of this role could be specified;
- whether they believe that tree planting is entirely incumbent upon individual households;
- what are local people's attitudes towards conservation and conservation agencies;
- what major factors would influence the above considerations (with particular reference to land availability and rights, local party politics and responsibilities for planting and maintenance);
- what ways community bodies may help to ensure that GSF and KSF are used sustainably.

After such a survey is undertaken, proper efforts and resources necessary would be determined and a management programme be implemented.

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PERSONAL COMMUNICATION

Mr. Myles Mander	Institute of Natural Resources, Univ. of Natal, 67 St. Patricks Rd. Scottsville, Pietermaritzburg.
Mr. Stephen Roberts	KZN/NCS, Box 662, Queens Elizabeth Park, Pietermaritzburg.
Mr. Henry Hlela	KZN/NCS, Box 662, Queens Elizabeth Park, Pietermaritzburg.
Mr. Pieter Thompson	KZN/NCS, Box 662, Queens Elizabeth Park, Pietermaritzburg.
Mr. Mngoma Langa	Endulini, Centocow, P/Bag x 206, Creighton.
Nkosi V. Zondi	Emnamaneni, Centocow, P/Bag x 206, Creighton.
Mr. and Mrs Dlamini	Endodeni, Centocow, P/Bag x 206, Creighton.

APPENDIX

CENTOCOW PLANT GATHERING QUESTIONNAIRE

Questionnaire no.___

Section A:(to be completed by interviewer)

Information about the interviewer

Name:_____________Date:_________ Locality:________________

Information about the gatherer

Gender: Male__ Female__ Locality:_______________

Section B: (gathering and effort)

1. Which forest do you use for gathering?
   a. KwaYili
   b. Gxalingenwa
   c. Other____________

2. For what purpose do you collect your plants?

F	M	B	Fe	C

F-Firewood M-Medicinal B-Building Fe-Fencing C-Carving

3. What type of plants do you gather more often?

F	M	B	Fe	C

4. During which month do you gather forest products?

F	
M	
B	
Fe	
C	

5. What part of the year is your gathering activities most active?

F	
M	
B	
Fe	
C	

6. How often do you gather these product and how many times?

F	M	B	Fe	C

D-Daily W-Weekly M-Monthly Y-Yearly

7. Why is your gathering activities so active?

a. More demand for resources
b. Resources are readily available(ripen)
c. Resources are easily accessible
d. You really need more money
e. Other____

8. How much material do you gather during each visit?

a. Checkers _____
b. Sacks ______
c. Bundles____
d. Other_____

9. How much time do you spend during each visit in the field gathering?____Hours ____Days

10. Do you have any people helping when gathering plants? Yes___ No___

11. If yes, state how many.____

12. How are these people related to you? Daughter__ Son__ Friend__ Other______

13. For how long have you been gathering?____weeks_____months_____years

14. How old are you?_____years

Section C (social & economics)

15. What is your occupation?(write in detail, incl. casual work)__________________

16. What is the highest education level you have reached?

a. No schooling
b. Attended junior school
c. Completed standard 8
d. Completed standard 10
e. Completed a diploma or degree

17. Approximately, how much money do you earn each month

a. Less than R50
b. Between R50 - R100
c. Between R100 - R250
d. Between R250 - R500
e. Between R500 - R1000
f. Between R1000 -R2000
g. More than R2000

18. Do you use any form of transport for your forest products? Yes___ No___

19. If yes, what is it? Car__ Bakkie__ Taxi__ Other_________

20. How much does it cost you to transport your plants? R____per___________

21. Are there other people in your immediate family who receive an income? Yes__ No__

22. If yes, how many____ and what are their occupations?______________

23. Where does he\she works? Migrant___ Local___

24. What is your major reason for gathering?______________________