Towards the Improvement of Policy and Strategy Development for the Sustainable Management of Non-timber Forest Products: Swaziland: A Case Study.

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DECLARATION

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

Signature: .....
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ABSTRACT

It is evident that existing, nominal, functional, national and international policies and legislation continue to be ineffective in combating the disastrous environmental and socio-economic consequences of unsustainable forest management. Several underlying causes to this failure were identified as: i) the lack of involvement or omission of the full range of stakeholders, in particular resource users, in the various steps and procedures of policy and legislation formulation and implementation; ii) these stakeholders are excluded in the review and updating of obsolete policies and legislation; iii) little emphasis is placed on sustainable forest management through the scientific understanding of natural forests and woodlands, including the dynamics of their ecology and socio-economics.

This study identified the key/critical aspects of the development process of policy and strategy for the sustainable management of non-timber forest products (NTFPs). This research study reviewed existing policies and legislation and the current status of the NTFP sector, conducted a series of community consultation meetings on resource use and management, user surveys and economic valuation, resource surveys and economic valuation, and made policy recommendations for the development of a concept and strategy for the sustainable management of NTFPs. The main focus was on the edible and medicinal NTFPs in the four ecological zones of Swaziland.

Review of existing national policies and legislation indicates that most of them are outdated, with gaps and overlaps, and there is lack of collaboration between institutions implementing these. As a consequence, International policies and legislation capture an excellent spectrum of elements and issues on NTFPs but still remain difficult to implement. It was recommended that national policies and legislation be reviewed and updated. Government and concerned agencies should develop and implement policies and legislation to provide secure access and benefits to people whose livelihood depends on/is supplemented by NTFPs. The analysis of the national status of the NTFP sector found that Swaziland currently has 18 categories of NTFPs (goods and services) according to existing national documents, interviews with subject matter specialists, and other existing literature. There are over 208 edible species, 39 species for household items, 338 species for medicinal use, 9 species for fuel wood, 53 species for handicrafts, 9 species for fodder and grazing, 52 species for cultural rituals, 13 species for tannin and dyes, 17 ornamental species, 8 species for thatching material, and the rest are still being investigated. However, there is still a lack of quantitative and qualitative statistics on NTFPs, especially their socio-economic value. Government, NGO's and the Private sector should work together to conduct research and generate, compile and

disseminate information on NTFPs resources (involving or engaging the communities in the process).

Community consultation meetings on the NTFPs resource use and management yielded twenty-one issues raised by community representatives, and these issues are reflected in at least seven different national policies/strategies/action plans. There is lack of traditional management systems for NTFPs. This study recommended that up-to-date General Principles of sustainable use and conservation of NTFPs must be adopted, tailored and implemented as suggested in several regional and international guidelines, with the technical assistance of Government and other agencies. User surveys and economic analysis indicated that NTFPs have a tremendous contribution to the rural household economy.

There were significant differences between sites in annual quantities harvested per household for edible NTFPs, in annual quantities harvested per household between communities, between sites in annual value per household, and in annual values per household between communities. Edible species were harvested in spring and summer over 4 weeks, 8 weeks, 12 weeks, 16 weeks, 20 weeks and 24 weeks. Only 57 species were reported as highly preferred species, across the four study sites. Use of medicinal NTFPs was significantly different between sites in annual quantities harvested per household, in annual quantities harvested per household between communities, in annual quantities harvested per household between households within sites, between sites in annual value per household, and in annual value per household between communities. Medicinal NTFPs were harvested all year round (or when necessary) over 1 to 9 months. About 65 species were reported as highly preferred across the four study sites.

Resource surveys and economic analysis showed that the standing stock of NTFPs species is highly valuable and comparable to results from South Africa and elsewhere. There were highly significant differences in the number of individual stems per species per plot between sites. There were no significant differences in the inventory value per plot between sites. The most remarkable observation was the lack of the common NTFPs species in the plots sampled over the four natural woodlands. This is due to uncontrolled and unsustainable harvesting for commercial purposes that have led to obvious patches in the forest, and forest degradation.

The key factors determining the variability in harvested quantities and values per household are: the wealth status, variability of species per site, season and duration of harvesting, commercialization, number of accessible natural woodlands within a site, need and demand, the household profile with regard to gender and age, and farm gate price differences. It is

recommended that in subsequent studies that these factors are put into linear regression to determine the weight of the coefficients representing each factor.

Based on the research findings, this study has made policy recommendations for the development of a new theoretical framework for the sustainable management of NTFPs at the local, national, regional and international levels. This theoretical framework is divided into a set of eleven strategies. These are:

Information and social communication;

Secure rights and access to products from natural forests and woodlands;

Adoption of innovative policies, revising and updating legislation and elaborating National Forestry programmes;

Development and implementation of national level Criteria and Indicators for Sustainable Forest Management;

Project planning and control techniques;

Local level guidelines for sustainable NTFPs management;

Conservation and financing mechanisms;

Collaboration and networking between all institutions involved in research and development of NTFPs;

Institutional strengthening and capacity building;

Education and training at all levels of community structures;

Research and Development.

OPSOMMING

Dit is duidelik dat bestaande nominale, funksionele, nasionale en internasionale beleid en wetgewing steeds oneffektief is om die rampspoedige omgewings- en sosio-ekonomiese gevolge van onvolhoubare bosbestuur te bestry. Verskeie onderliggende oorsake van sodanige tekortkominge is ge-identifiseer as: i) die gebrek aan betrokkenheid of uitlating van die volle omvang van belanghebbendes, spesifiek huplbrongebruikers, in die verskillende stappe en prosedures van beleid- en wetgewing formulering en implementering; ii) hierdie belanghebbendes word uitgesluit van die hersiening en opdatering van verouderde beleid en wetgewing; iii) min klem word geplaas op volhoubare bosbestuur deur middel van ‘n wetenskaplike begrip van woude en boomveld, insluitend die dinamika van hul ekologie en sosio-ekonomie.

Hierdie studie het die sleutel/kritiese aspekte van die ontwikkelingsproses van beleid en strategie vir volhoubare bestuur van nie-hout bosprodukte (NHBPe) ge-identifiseer. Hierdie navorsing het ‘n oorsig gemaak van bestaande beleid en wetgewing, en die huidige status van die NHBP sektor, ‘n reeks gemeenskapskonsultasievergaderings gehou oor hulpbrongebruik en –bestuur, gebruikersopnames en ‘n ekonomiese valuasie uitgevoer, en het beleidsaanbevelings gemaak vir die ontwikkeling van ‘n konsep en strategie vir die volhoubare bestuur van NHBPe. Die hoof fokus was op eetbare en medisinale NHBPe in die vier ekologiese sones van Swaziland.

Die oorsig van bestaande nasionale beleid en wetgewing het getoon dat die meeste van hulle verouderd is, met gapings en oorvleuelings, en dat daar ‘n gebrek is aan samewerking tussen die instansies wat dit moet implementeer. Die gevolg is dat internasionale beleid en wetgewing vervat ‘n uitstekende spektrum van elemente en geskille oor NHBPe maar bly steeds moeilik om te implementeer. Dit is aanbeveel dat nasionale beleid en wetgewing hersien en opgedateer moet word. Die Regering en betrokke agentskappe moet beleid en wetgewing ontwikkel en implementeer om versekerde toegang en voordele aan mense wie se lewensbestaan afhanklik is van / ondersteun word deur NHBPe. Die ontleding van die nasionale status van die NHBP sektor in Swaziland het getoon dat daar tans 18 kategoriee van NHBPe (goedere en dienste) in Swaziland is, volgens bestaande nasionale dokumente, onderhoude met onderwerpspesialiste, en ander bestaande literatuur. Daar is meer as 208 eetbare soorte, 39 soorte vir huishoudelike items, 338 soorte vir medisinale gebruik, 9 soorte vir vuurmaakhout, 53 soorte vir handwerkitems, 9 soorte vir voer en weiding, 52 soorte vir kulturele rituele, 13 soorte vir looistof en kleurmiddels, 17 ornamentele soorte, 8 soorte vir dekmateriaal, en die res word steeds ondersoek. Desnieteenstaande is daar steeds ‘n gebrek

aan kwantitatiewe en kwalitatiewe statistiek oor NHBPe, veral hul sosio-ekonomiese waarde. Die Regering, nie-regeringsorganisasies en die privaatsektor moet saamwerk om navorsing te doen om inligting te genereer, saam te stel en te versprei oor NHBP hulpbronne (en behoort die gemeenskappe in die proses betrek en verbind).

Gemeenskapskonsultasievergaderings oor NHBPe hulpbrongebruik en –bestuur het 21 kwessies opgelewer wat deur gemeenskapsverteenwoordigers ge-opper is, en hierdie kwessies word in minstens sewe verskillende nasionale beleidstukke/strategiee/aksieplanne gereflekteer. Daar is ‘n gebrek aan tradisionele bestuursisteme vir NHBPe. Hierdie studie het aanbeveel dat die nuutste Algemene Beginsels van volhoubare gebruik en bewaring van NHBPe moet aangeneem, aangepas en ge-implementeer word soos voorgestel in verskeie streeks- en internasionale riglyne, met die tegniese ondersteuning van die Regering en ander agentskappe. Gebruikeropnames en ekonomiese analises het getoon dat NHBPe het ‘n geweldige bydrae tot die ekonomie van landelike huishoudings.

Daar was betekenisvolle verskille tussen studie areas in die jaarlikse hoeveelhede ge-oes per huishouding vir eetbare NHBPe, in jaarlikse hoeveelhede ge-oes per huishouding tussen gemeenskappe, tussen studiegebiede, in jaarlikse waarde per huishouding, en in jaarlikse waardes per huishouding tussen gemeenskappe. Eetbare soorte is ge-oes in lente en somer oor 4 weke. 8 weke, 12 weke, 16 weke, 20 weke en 24 weke. Slegs 57 soorte was aangegee as hoogs gewenste soorte, oor die vier ekologiese sones. Gebruik van medisinale NHBPe was betekenisvol vesrkillend tussen studiegebiede in jaarlikse hoeveelhede ge-oes per huishouding, in jaarlikse hoeveelhede ge-oes per huishouding tussen gemeenskappe, in jaarklikse hoeveelhede ge-oes per huishouding tusen huishoudings binne studiegebiede, tussen studiegebiede in jaarlikse waarde per huishouding, en in jaarlikse waarde per huishouding tussen gemeenskappe. Medisinale NHBPe word deurlopend deur die jaar ge-oes (of wanneer benodig) oor 1 tot 9 maande. Omtrent 65 soorte is aangegee as hoogs gewenst oor al vier die studiegebiede.

Hulpbronopnames en ekonomiese analise het getoon dat die staande voorraad van NHBP soorte is hoogs waardevol en vergelykbaar met resultate vanaf Suid-Afrika en elders. Daar was hoogs betekenisvolle verskille in die aantal individuele stamme per sort per perseel tussen studiegebiede. Daar was geen betekenisvolle verskille in die opnamewaarde per perseel tussen studiegebiede nie. Die mees uitstaande waarneming was die gebrek aan algemene NHBP soorte in persele bemonster oor die vier areas met natuurlike boomveld. Dit is die gevolg van onbeheerde en nie-volhoubare inoesting vir kommersiele redes wat gelei het tot opvallende oop kolle in die bos, en bos-degradering.

Die sleutelfaktore wat die variasie in ge-oeste hoeveelhede en waardes per huishouding bepaal, is: rykdomstatus, variasies in soorte per studiegebied, seisoen en duurte van oes, kommersialisering, aantal bereikbare natuurlike boomveld binne ‘n studiegebied, behoefte en aanvraag, profiel van ‘n huishouding met betrekking tot geslag en ouderdom, en plaashek prysverskille. Dit word aanbeveel dat in toekomstige studies hierdie faktore in ‘n lineêre regressie gebruik word om die gewig van die koeffisiënte wat elke faktor verteenwoordig, te bepaal

Gebaseer op die navorsingsbevindinge, is in hierdie studie aanbevelings gemaak vir die ontwikkeling van ‘n nuwe teoretiese raamwerk vir die volhoubare bestuur van NHBPe op die plaaslike, nasionale, streeks- en internasionale vlakke. Hierdie teoretiese raamwerk is verdeel in ‘n stel van elf strategieë. Hulle is:
Inligting en sosiale kommunikasie;
Versekerde regte en toegang tot produkte vanuit natuurlike woude en boomveld;
Opneem van innoverende beleidstukke, hersiening en opdatering van wetgewing en uitbouing van Nasionale Bosbouprogramme;
Ontwikkeling en implementering van nasionale vlak Kriteria en Indikatore vir Volhoubare Bosbestuur;
Projekbeplanning en kontrole tegnieke;
Plaaslike vlak riglyne vir volhoubare bestuur van NHBPe;
Bewaring en finasieringmeganismes;
Samewerking en netwerke tussen alle instansies betrokke in navorsing en ontwikkeling van NHBPe;
Institusionele versterking en bou van kapasiteit;
Opvoeding en opleiding op alle vlakke van gemeenskapstrukture;
Navorsing en Ontwikkeling.

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DEDICATION

I dedicate this work to all the researchers and scholars in the field of Policy and Strategy Development and Implementation for the sustainable management of Non-Timber Forest Products.

ACRONYMS

ACP	African Caribbean and Pacific
AIP	Alien Invasive Plants
ANOVA	Analysis of Variance
BSAP	Biodiversity Strategy and Action Plan
CBD	Convention on Biodiversity
CCD	Convention to Combat Desertification
CMA	Common Monetary Area
CITES and	Convention on International Trade in Endangered Species of Flora Fauna
C&I	Criteria and Indicators
CPM	Comprehensive Mitigation Plan
CSO	Central Statistics Office, Swaziland
DANCED	Danish Corporation for International Development
DBH	Diameter at Breast Height
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GMO's	Genetically Modified Organisms
GOS	Government of Swaziland
GTZ	German Technical Cooperation
Ha	hectares
Ht	Height
IUCN	International Union for the Conservation of Nature
JFM	Joint Forest Management
JPFM	Joint Participatory Forest Management
LSD	Least Significant Difference
m	Metres

MOAC	Ministry of Agriculture and Cooperatives
MTEC	Ministry of Tourism, Environment and Communications
NFP	National Forest Policy
NGO's	Non-Governmental Organizations
NRA	Natural Resource Accounting
NTFP	Non-Timber Forest Product
NTFPs	Non-Timber Forest Products
NTFS	Non-Timber Forestry Sector
NWFP	Non-Wood Forest Products
PFM	Participatory Forest Management
Ph.D.	Doctor of Philosophy
RDA	Rural Development Area
SACU	South African Customs Union
SADC	Southern African Development Community
SAS	Statistical Software (normally used in quantitative studies)
SEAP	Swaziland Environmental Action Plan
SFM	Sustainable Forest Management
SNA	System of National Accounts
SNL	Swazi Nation Land
SNTC	Swaziland National Trust Commission
SPSS	Statistical Software (normally used in qualitative studies)
TDL	Title Deed Land
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNFCCC	United Nations Framework Convention on Climate Change

GLOSSARY

Biometric - the application of statistical methods when measuring biological objects (adapted from shorter Oxford English Dictionary)

Enumeration - process of measuring specific parameters in forest inventory (Wong *et al.*, 2001)

Forest - a vegetation type dominated by trees, which may be pristine rainforest, scrub woodland; palm savanna or plantation (Wong, 2000). According to FAO (1993) forests are ecosystems with a minimum of 10% crown cover of trees or bamboos.

Forest Inventory - a sample-based survey of the forest resource, the intention being to quantify the abundance of biological resources in the forest (Wong *et al.,* 2001)

Natural forests - being those forests comprising tree species known to be indigenous to the area (FAO, 1993)

Non-Timber Forest Products - refers to a vast array of goods and services of biological origin derived from the forest, other wooded land and trees outside forests, including small wood and fuel wood (FAO, 2002). *Synonyms* - Alternative Forest Products (AFP), Non-Timber Plant Products (NTPP), Minor Forest Products (MFP), Non-Wood Forest Benefits NWFB), Non-Wood Forest Resources (NWFR), Non-Wood Goods and Benefits (NWGB), Non-Wood Goods and Services (NWGS), Special Forest Products (SFP), and Secondary Forest Products (SFP) (Wong, 2000).

Non-Wood Forest Products - are goods of biological origin derived from forests, other wooded land and trees outside forests which include a broad spectrum of animal and plant products other than timber, fuel wood and small wood (FAO, 2002).

Opportunity cost - refers to the cost of investment opportunity forgone (i.e. an opportunity substituted by an alternative): in non-monetary terms for example, one opportunity cost of an intensively managed timberland could be certain recreation benefits forgone. In monetary terms, it refers to the best interest earning rate or dollar income that could be earned on a given amount of capital if not in current use (Klemperer, 1996)

*Plantation*s - are forests established artificially (through afforestation or reforestation) (FAO, 1993)

Product - anything produced or obtained as a result of some operation of work, as by generation, growth, labour, study or skill (Lund, 1998)

Qualitative - descriptive

Quantitative - numeric

Stratification - division of population into parts for the purpose of selecting a representative sample

Survey - to examine as to the condition, situation or value and query in order to collect data for the analysis of some aspect of a group or area (Lund, 1997)

Sustainability - the capacity of forests to maintain their health, productivity and overall integrity in the long-term, in the context of human behaviour such as activities that affect the forest resource, for example, exploitation and degradation

Yield - the harvest of produce, actual or estimated, from either plants or animals expressed in form of numbers or weight or as a fraction of a standing crop or over a given period of time

CHAPTER 1: BASIS AND RATIONALE OF THE CURRENT NTFPs STUDY

1.1 BACKGROUND

The pressure on natural forests and woodlands in most parts of the world requires a clear picture of the products and services, the users and uses for efficient policy-making and sustainable forest management planning. This Non-timber Forest Products (NTFPs) study is a first step towards an integrated approach to policy and strategy development for sustainable management of natural forests and woodlands in Swaziland. A multi-dimensional approach to strategy development should include a number of diverse studies (FAO, 1995, 2001, 2003a; Crafter *et al.,* 1997; Mogaka *et al.,* 2001; Barrow *et al.,* 2002). A review is required of existing policies and legislation to determine adequacy and potential gaps. Analysis of the status of the NTFP sector is necessary to understand its extent and importance. Community consultations and ethno botanical surveys are important to understand user demand in relation to supply and economic value of products used. An inventory of the resource (standing stock) and its potential economic value in relation to the demand should form the basis for formulation of a concept for the sustainable management of forest resources. Previous studies on sustainable management of NTFPs have not included a combination of all the above critical aspects in the development process of policy and strategies, and often this has lead to ineffective policies (Crafter *et al*., 1997; FAO, 2001, 2003b; Mogaka *et al.,* 2001; Barrow *et al.,* 2002; Vedeld, *et al*., 2004; Willis, 2004).

The total value generated by a forest consists of wood and non-wood goods and services (Buttoud, 2000; Gluck, 2000). Goods and services of the forest resource can be classified into three broad categories, namely direct use benefits, indirect use benefits and intermediate use services (DANCED, 2000a; Hassan, 2001; Hassan *et al.,* 2002; Shackleton, 2002, Shackleton and Shackleton, 2004). Direct use benefits include timber for construction and furniture, wood for crafts and household tools, fire wood, construction poles, wild fruits, wild vegetables, wild herbs, honey, bush meat, insects for food, bird eggs, medicinal products, thatch, grass hand-brushes, twig hand-brushes, weaving reeds, sand/clay, plant dyes, plant resins, seeds for rattles and decoration and other benefits. Indirect use benefits include pollination services, livestock grazing, recreation/aesthetic services (eco-tourism), religious functions and other benefits. Intermediate use services comprise carbon sequestration, water shed protection, protection against soil erosion, habitat for wild fauna and flora (breeding and nursery functions), biodiversity reserve, oxygen production, acid rain deposition, roles in the water cycle, runoff reduction (cultivated) and other services.

Consequently, forest values can be classified into four broad categories: direct use values, indirect use values, option values and existence values (McKenney and Sarker, 1994; Clarke *et al.*, 1996; Buttoud, 2000; Shackleton *et al*., 2000; Chipeta and Kowero, 2004; Clarke and Grundy, 2004).

In the past, the focus in forest management has been on commercial timber, which is regarded as the primary forest product (Peters *et al.,* 1989; Chopra, 1993; Godoy *et al.,* 1993; McKenney and Sarker, 1994; DANCED, 2000b; Wong *et al.,* 2001; Hassan *et al.,* 2002). However, it is becoming clear that economically, environmentally, culturally and socially, non-timber forest goods and services are equally important (Falconer, 1992; Gunatilake *et al.,* 1993; Chamberlain *et al.,* 1998; Langoya and Long, 1998; Robles-Diaz-De-Leon and Kangas, 1999; Chapeskie, 1999; Shackleton *et al.,* 2000; Dovie *et al.,* 2001; Hassan *et al.,* 2002; FAO, 2003a; Clarke and Grundy, 2004; Lawes *et al*., 2004; Shackleton and Shackleton, 2004, 2005; Olsen, 2005). However, in Swaziland in particular there has not been any commercial exploitation of timber from natural forests and woodlands, except extraction of timber for farm structures (DANCED, 2000b; Hassan *et al*, 2002).

The working definition of NTFPs is "the vast array of goods and services of biological origin (including fuel wood and small wood) derived from forests, other wooded land and trees outside forests, that may be gathered from the wild, or produced in forest plantations, agro-forestry schemes and from trees outside forests" (FAO, 2002). This would include wild edible mushrooms, floral and greenery products, wild berries and fruit, herb and vegetable products, medicinal and pharmaceutical products, craft products, landscaping products and miscellaneous botanical forest products. This study is mainly concerned with NTFPs and particularly edible and medicinal products (which may also fall under non-wood forest products, or NWFPs). This term is often used as a synonym for NTFPs in scientific literature. For clarity, NWFPs are defined as goods of biological origin derived from forests, other wooded land and trees outside forests (TOF), which include a broad spectrum of animal and plant products other than timber, fuel wood and small wood (FAO, 2002). Millions of people worldwide harvest and use NTFPs for domestic and commercial purposes regularly or as alternatives during times of adversity (Shackleton and Shackleton, 2005).

Although it is easy to define and measure timber outputs from the forest, many NTFPs are often difficult to define and quantify (Balick and Mendelson, 1992; McKenney and Sarker, 1994; Shackleton *et al.*, 2000; Gram, 2001; FAO, 2001, 2003a). An internationally accepted standard classification of NTFPs is yet to be developed.

NTFPs are classified in many different ways, for example by end use and plant part used (Chandrasekharan, 1995; Cook, 1995; Temu, 1995). A tentative classification system for ease of data collection by researchers for the regional outlook of NWFPs in Africa from various international classification systems was inconclusive (FAO, 2001). The categorisation of NTFPs is important for resource assessment and economic valuation purposes (FAO, 2001; Hassan *et al*., 2002).

The lack of recognition for NTFPs has several causes (Wong *et al.,* 2001). Historically, synthetic alternatives substituted significant NTFPs. Some major NTFPs such as oil palm, rubber, and cocoa are domesticated as agricultural crops and are no longer harvested from natural forests. There is institutional lack of regard for indigenous people and their dependence on NTFPs for subsistence and income generation. Nevertheless, there is currently growing interest in NTFPs amongst foresters, development workers, environmentalists, conservationists and indigenous people. This is mainly due to the great potential of NTFPs in income generation for rural development, more equitable benefit sharing in forest resources and participatory forest resources management (Falconer, 1992; Mauambeta, 2000; Milol, 2000; Montagne and Mamoudou, 2000; Nana, 2000; Wong *et al.,* 2001; Grundy and Mitchell, 2004; Shone and Harris, 2005; Shackleton and Shackleton, 2005). NTFPs are slowly gaining attention and recognition in forestry and related sectors worldwide because of their significant contribution to local, national, regional and international economies (Balick and Mendelson, 1992; Falconer, 1992; Appasamy, 1993; Chopra, 1993; Godoy and Bawa, 1993; Godoy *et al.,* 1993; McKenney and Sarker, 1994; FAO, 1995, 2001; Clarke *et al*., 1996; Crafter *et al.,* 1997; Robles-Diaz-De-Leon and Kangas, 1999; Yembi, 1999; Dovie *et al*., 2001; Dovie, 2003a; Gram, 2001; Vedeld *et a*l, 2004; Olsen, 2005; Janse and Ottisch, 2005; Trauernicht and Ticktin, 2005; Shone and Harris, 2005; Shackleton and Shackleton, 2005).

The availability of many tropical and sub-tropical species used as NTFPs is of great international concern. Firstly, deforestation will lead to elimination of a significant number of tropical species in the next few decades (Appasamy, 1993; Hall and Bawa, 1993). Secondly, effective conservation and management of NTFPs is necessary to improve the rural economy and well being of many native societies (Crafter *et al*., 1997; Shackleton *et al*, 2000; Shackeleton and Shackleton, 2004; Clarke and Grundy, 2004; Lawes *et al*., 2004; Shone and Harris, 2005). Thirdly, there is overwhelming recognition that rural communities that survive on NTFPs should fully participate in biodiversity management and conservation programmes (McKenney and Sarker, 1994; Alexander and McLain, 2001; Dovie, 2003b; Grundy and Mitchell, 2004; Willis, 2004). Fourthly, many NTFPs species are likely sources of new genes

and new products, especially in ethno pharmacology (Appasamy, 1993; Hall and Bawa, 1993; Godoy *et al.,* 1993; Godoy and Bawa, 1993).

Development of NTFPs is a challenging field, which involves a fundamental change in approach to ecological, silvicultural, socio-economic and trade issues associated with forestry (FAO, 1995, 2001). NTFPs are not just a group of products but also an integral part of the concept of integrated and sustainable management of forests and related ecosystems that yield tremendous socio-economic benefits (FAO, 1995, 2001; Crafter *et al*., 1997).

The Commercial Products from the Wild (CPWild) Consortium engaged in research programmes on indigenous plant domestication and commercialization in Southern Africa (CP Wild, 2004). This Consortium comprises members from University of Stellenbosch, Institute of Natural Resources at University of KwaZulu-Natal and the University of Pretoria. This successful project established in 1998 has since developed 26 new fibre products, 14 medicinal products and 6 fruit products; produced more than 60 reports and publications; established 2 fibre craft enterprises and a large fibre craft co-operative; established 2 medicinal enterprises; established a medicinal bark harvesters association with the legal rights to harvest bark from natural forests and woodlands; and empowered 8 small-scale farmers, trained in the cultivation of indigenous fruit trees and processing of indigenous fruit products. Through the established black-owned and operated enterprises, a large number of people are now employed and revenue is generated in the rural areas. The CPWild Consortium is seeking to establish a commercialization and domestication initiative that focuses on South Africa, Namibia, Botswana, Zimbabwe, Malawi, Mozambique, Swaziland and Lesotho. The main aim is to develop the use of natural forest and woodland resources for socio-economic benefit in the SADC region of Africa.

Exploitation of NTFPs would provide benefits while conserving the forest resource, but promotion of their development and sustainable management is slow (Peters, *et al.,* 1989). There is no scientific basis in the planning for NTFPs at the international level due to the general absence of resource inventories (FAO, 1995, 2002). However, efforts are underway in the development of biometrically sound resource-inventory protocols for the African, Caribbean and Pacific (ACP) countries regarding NTFPs (FAO, 2002). Uncontrolled, unsustainable harvesting practices and rates heavily affect many natural forests and woodlands and targeted species (Geldenhuys, 2002, 2004).

In South Africa, Geldenhuys (2002) developed interesting concepts and approaches towards development of sustainable resource use of NTFPs, with bark harvesting for traditional

medicine as an example. He advocated an integrated action plan of research for business development through adaptive management research to ensure or promote sustainable management and utilization of natural forests and woodlands.

The intervention considered concepts such as sustainable resource use, resource dependent business diversification, diverse community needs and interest, and matching resource use needs with resource availability in the context of rural business development programmes.
FAO (2001) gives a comprehensive research report of the common NWFPs in Africa, (North Africa, East Africa, East African Islands, Southern Africa, Central Africa, and West Africa). The value, use and management of NTFPs in Africa, with some examples from Latin America, are highlighted in Crafter *et al,* (1997). Both studies show that rural communities extract NTFPs mainly for subsistence, bartering and commercial purposes. They indicated that sustainable management of these resources requires full cooperation of adjacent communities. If adjacent communities are not involved in the management and conservation programmes of the forest resources around them, they tend to harvest the products unsustainably. If they are involved, they tend to have a sense of ownership and act responsibly towards the resources (Hall and Bawa, 1993; Godoy *et al.,* 1993; Wong *et al.,* 2001; Geldenhuys 2003, 2004). Lessons learnt in South Africa from bark harvesting for traditional medicine confirm that protecting forests and species is not enough to ensure their survival. It was recommended that appropriate resource management should involve potential resource users for a shared responsibility (Geldenhuys, 2004).

Despite the role of NTFPs in local and national economies, the economic value of NTFPs is omitted from the System of National Accounts (SNA) or unaccounted for at the macro-policy level (Dovie *et al*., 2001; Clarke and Grundy, 2004). Their value is often reflected under other sectors, such as other sources of subsistence and commercial products (Appasamy, 1993; Dovie *et al.,* 2001; Hassan, *et al.,* 2002; Chipeta and Kowero, 2004). For example, tourism statistics in Swaziland is under the hotel industry, and not under Forestry. There is an urgent need to include NTFPs in the System of National Accounts (Hassan *et al.,* 2002; Vedeld *et al*., 2004). This may prevent further uneconomical land conversion from natural forests into other developmental activities (Godoy *et al.,* 1993; Vedeld *et al*, 2004). Godoy *et al.,* (1993) strongly recommended that policy makers and development organizations are given an accurate estimate of the opportunity cost of the forest; this will in turn help them evaluate proposed projects and discard economically disadvantageous ones.

Sometimes it may be socially and economically optimal to leave the natural forests and woodlands to local communities, without further disturbance by other landuse options (eg.

development projects), for the extraction of NTFPs and indirect use benefits and intermediate use services. There is therefore an urgent need for due recognition of NTFPs in the SNA (Appasamy, 1993; FAO, 1995, 2001; Crafter *et al.,* 1997; Vedeld *et al,* 2004). This will enhance proper and careful decision-making with regard to strategic environmental assessment and environmental impact assessment in project development. Natural forests and woodlands will not be destroyed haphazardly but their environmental and socio-economic value will be assessed alongside other landuse options. A policy message to governments, donors and international agencies by Vedeld *et al.,* (2004) was that: "leaving forest environmental income out of national statistics and poverty assessments will lead to underestimation of rural incomes, and lack of appreciation of the value of the environment."

NTFPs valuation of the forest resources in forest resource economics considers the inventory (the stock quantity in the forest) and the flow (the quantities that people actually use). It is advisable therefore, that researchers consider both the inventory and the flow values since the former may be a meaningless concept related to neither present use nor sustainable use (Godoy *et al.,* 1993). This relationship between the biophysical resources and the human resources, or simply matching resource use needs with resource availability, forms a conceptual basis for integrated sustainable resource management (Figure 1.1, from Geldenhuys, 2002).

There are methodological shortcomings in the economic valuation efforts for NTFPs (Gram, 2001). This is because most researchers use methodologies that are subject to uncertainty. Godoy *et al*. (1993), in Wong *et al.* (2001), gave a comprehensive summary of methodological shortcomings in recent international NTFPs resource assessment studies and recommended better methodologies for various kinds of information required. In addition to that, Vedeld *et al*. (2004) reviewed several studies (on forest incomes and the rural poor) that displayed a high degree of theoretical and methodological pluralism that has been attributed to methodological pitfills and weaknesses observed in most studies. A scientific and biometrically sound methodology or protocol for resource assessment and economical analysis is therefore imperative (Wong *et al.,* 2001).

The socio-economics of NTFPs entail resource assessment and user surveys and these include sophisticated valuation techniques. Valuing NTFPs entails non-wood values of those goods and services produced by forestlands, which enter an individual's preference function and for which individuals are willing to commit their scarce resources (McKenney and Sarker, 1994; Faber *et al.*, 2002; Turner *et al*., 2003). It is important to note that from an economics point of view all values are anthropocentric in nature, i.e. assigned by human beings and are human

oriented. Non-wood services fall under the category of non-market values, and these are values for goods and services for which there are no explicit markets or prices. There are two categories of non-market values namely Use and Non-use Values. However, they have a price/value in the informal market sector, directly in monetary terms, and indirectly in the value of the goods and services they are bartered for (McKenney and Sarker, 1994).

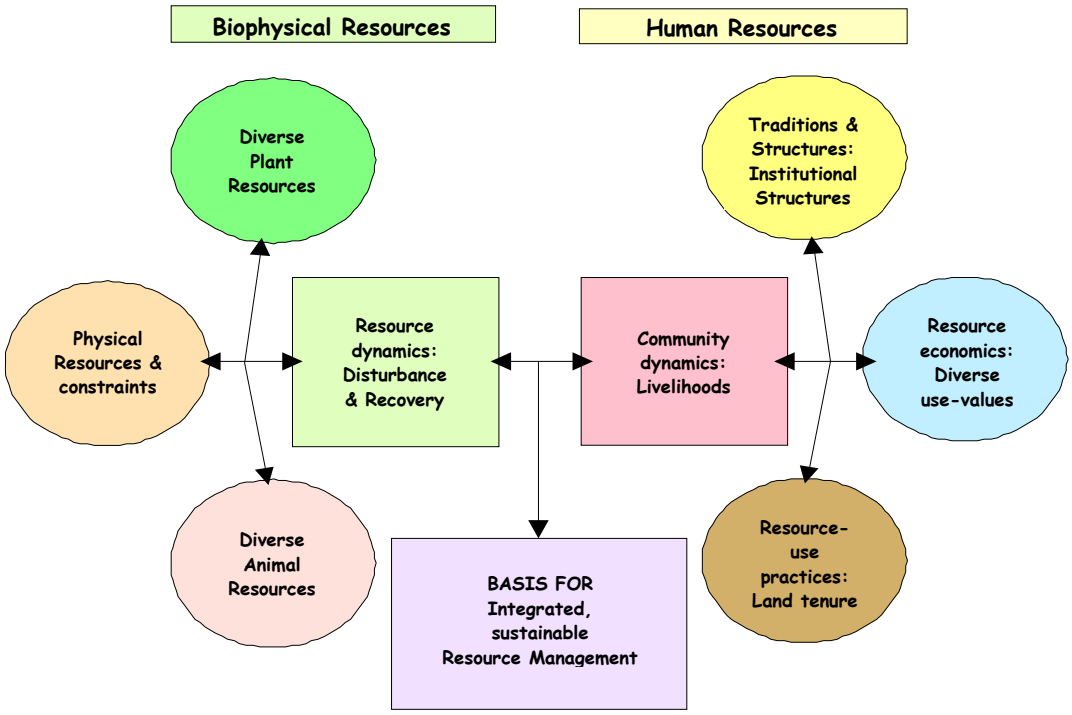

Figure 1.1: Matching resource use with resource availability
(Adopted from Geldenhuys, 2002)

Numerous valuation techniques were developed over the past three decades to derive monetary estimates of the value of changes in quality and quantity of different non-market goods and services (Peters *et al.,* 1989; Appasamy, 1993; Chopra, 1993; Godoy *et al.,* 1993; McKenney and Sarker, 1994; Hedge *et al.,* 1996; Robles-Diaz-De-Leon and Kangas, 1999; Faber *et al*., 2002; FAO, 2003a,b; Chipeta and Kowero, 2004; Shone and Harris, 2005). There are two main groups of valuation techniques: Direct (surveys) and Indirect (observed market information and statistical analysis) methods. McKenney and Sarker (1994) present a schematic diagram of the various un-priced valuation methods. These techniques, applied internationally, assist in the assessment of many un-priced values. Value estimates for natural forests and woodlands are useful in guiding policy-making and the design of development programmes.

Resource valuation, amongst other factors, in Southern Africa has been driven by the growing concerns about resource and environmental degradation and biodiversity loss resulting from the dependency and unsustainable harvesting of forest resources by local people as well as traders and other collectors (Clarke and Grundy, 2004; Chipeta and Kowero, 2004; Shackleton and Shackleton, 2004; Lawes *et al*., 2004; Shone and Harris, 2005).

Valuation can provide the basis for understanding the trade-off inherent in the conversion of natural forests and woodlands into arable land or other land use options (Godoy *et al*., 1993; Dovie *et al*., 2001; Clarke and Grundy, 2004).

1.2. HIGHLIGHTS OF VALUATION STUDIES FOR NTFPs

An overview of NTFPs valuation efforts in Ontario found that the contribution of forestry to society goes beyond wood production. Therefore, we need to adopt the recognition and incorporation of NTFPs in management decision-making. These products form an integral part of the forest biodiversity (McKenney and Sarker, 1994). Balick and Mendelson (1992) quantified the value of managing forests as a source of traditional medicines in the tropical rainforests. They had two sample plots, considered representative enough of the whole range of forest species. These plots were cleared to harvest marketable medicinal plant material and the yield was extrapolated on a 'per ha' basis. The net economic value per ha of the forest was calculated in consultation with traditional healers and local markets. Marginal cost of extraction and processing, including transportation, was deducted from the total value. The values compared well with those of alternative land uses in the region. The average value for selected medicinal plants was US$60/ha/year.

To give a conservative estimate of the value of the forest, an economic model for the harvest of NTFPs (fruits, nuts, and ornamental plants) from a model riparian forest buffer zone in the Chesapeake Bay region in Maryland USA, was made (Robles-Diaz-De-Leon and Kangas, 1999). Calculation of potential gross income from the harvest of NTFPs showed the feasibility of this strategy. Given certain assumptions, the income can be up to US$60/ha/year, which compares well with other land uses in the region. This shows that the worth of the forest resource is high even when based on a single product irrespective of other products and services of the forest.

An Amazonian rainforest was valued by means of a systematic botanical survey, counting the number of individual target tree species, the annual production per species (which was through direct observation and interviewing local collectors) and the unit price of products

(Peters *et al.,* 1989). The study concentrated on edible fruit from trees and excluded timber and under-story medicinal species within the 1-ha sample of the forest. The estimated value of the forest was US$698/ha/year, which was a conservative value since other species were omitted.

In India, the valuation of NTFPs in the Tropical deciduous forests (which form the major part of the area under forests) shows that the forests constitute a significant component of the natural capital of the economy (Chopra, 1993). Main goods and services of interest include fuel wood, fodder, forest products, services of tourism, soil conservation, and nutrient recycling through litter fall, maintaining the hydrological cycle and biodiversity preservation. A study on the extraction of NTFPs in the forests of Biligiri Rangan Hills of the Karnataka State in South India looked at the contribution of NTFPs to rural income (Hedge *et al.,* 1996). The study revealed that these products account for nearly half of the gross annual income earned by the Soliga households in the Biligiri Rangan Hills. The research further indicated that econometric models show that although income derived from the extraction of NTFPs is high in proportion to the time devoted to the collection, the extraction is not a preferred vocation.

A study on the comparative value of wild and domestic plants in home gardens of a South African village showed that, on average, each household utilized four to five species of wild plants growing in their gardens (High and Shackleton, 2000). The total value of all plants (wild plants and domesticated crops) was US$269 per household per year. Wild plants represented 31% of this total value.

A study on the direct use values of secondary resources harvested from communal savannas in the Bushbuckridge lowveld in South Africa showed that only five of the 11 secondary resources studied (fuel wood, construction wood, edible fruits, edible herbs and medicinal plants) represented over 94% of the total value per hectare (Shackleton and Shackleton, 2000). The same study revealed that on a per household basis, only 3 of the 11 secondary resources studied contributed 10% or more to the total direct use value (US$386 used at home and US$767 traded), and together contributed greater than 71% of the total direct use value per household. Two thirds of the value per household was traded locally with other households or regionally, rather than consumed at home.

Dovie *et al.* (2001) presented a study that comprehensively examined woodland resource (mainly NTFPs) utilization, valuation and rural livelihoods in the context of all livelihood sectors in South Africa in 1999. The study reported that the direct use values of NTFPs alone

contribute to 19.4% of total value of all livelihoods, and 38.2% by agro-pastoralism, excluding traded values. These results could be used as indicators for assessing the extent of use and possible linkage with poverty, and impacts on the environment due to remarkable changes in the resource base. The study valued the consumption of fuel wood energy to be US$311 per household per annum, wild edible fruits and herbs to be US$193 per household per annum and medicinal plants to be US$41 per household per annum.

A recent study on the role and value of savanna NTFPs to rural households in the Kat River Valley in South Africa found that limited infrastructure and unemployment has lead to extensive use of NTFPs for the inhabitants' daily livelihoods (Shackleton *et al.,* 2002). The study showed that all households made use of at least one NTFP from the surrounding woodlands. The top five NTFPs contributing most to total gross value per household were fuel wood, wild herbs, wild fruits, bush meat and honey beer. The mean gross annual direct-use value at the three villages ranged from US$211 to US$324 per household, averaged across user and non-user households. The direct-use value to user households was approximately double this value.

A case study of the former Central Transvaal (now Mpumalanga) assessed the potential of secondary forest products harvesting in the stimulation of local rural economies (Shackleton, 1996). This study concentrated on the cash value of four selected secondary products namely the wild edible fruits of *Sclerocarya birrea* (Marula), fuel wood, thatch grass and carving timber. The total annual value for the region ranges around US$56 million at US$0.03 kg^{-1}, for *Sclerocarya birrea,* US$6.5 million at US$0.5 kg^{-1} for fuelwood, to US$2.1 million for thatch grass and US$400 000 for carving woods. These results suggest that there is considerable value attached to NTFPs and efforts should be made to develop local processing centers for the raw materials to create employment opportunities and stimulation of a local rural economy.

Clarke *et al.* (1996) reported contingent valuation methods that found an annual flow of approximately US$100 per household per year (at 20% discount rate) for Zimbabwe, most of which is derived from ecological services. Campbell *et al*. (1997) similarly estimated even lower returns at US$50 –85 per household per year. Another attempt to estimate total income, at farmgate prices for tree products gave a total of US$120 per household per year (Clarke *et al*., 1996). A cross-check on estimates of value can be made by assessing consumers' expressed willingness to pay for products and services from woodlands (Clarke *et al*., 1996). A study carried out in rural Zimbabwe by Clarke *et al*., (1996) revealed the highest interest was in firewood rather than other commodities including construction wood.

Overall, little is known about the sustainability of the current and prevailing systems and patterns of resource use and harvesting, and the implications for sustainable resource management and rural livelihoods in Southern Africa (Shackleton and Shackleton, 2004). However, there is a growing trend of commercialization of NTFPs in Southern Africa (Clarke *et al*., 1996, Clarke and Grundy, 2004, Lawes *et al*., 2004; Shackleton and Shackleton, 2004).

1.3 JUSTIFICATION FOR THE RESEARCH

The new National Forest Policy Project of Swaziland, with the technical assistance of DANCED, embarked on a brief research study in the year 2000 that looked into the NTFP Sector of the country and in particular within the Natural forests and Woodlands (DANCED, 2000b). The findings of the study revealed that the value of NTFPs is not included in the System of National Accounts, yet about 60% to 70% of the population still rely on these resources for food and medicine as well as other goods and services such as livestock grazing, household items, fuel wood, handicrafts, soil conservation, tourism, ornamental plants, tannin, poles and fencing and many more. The undermining of these important resources has led to the opportunity cost of the forest being ignored, leading to land conversion from natural forest and woodlands into agriculture and other industrial operations, mainly in the Lowveld (DANCED, 2000b). This has caused serious loss of biological diversity in the country and irreversible environmental hazards. The National Forest Policy has then produced a National Forestry Action Programme (GOS, 2002a). Consequen tly, the Immediate Action Programme of the National Forestry Action Programme called for an urgent baseline study to valuate NTFPs, which led to this Research Study.

The following is a summary of current irregularities in the NTFP sector that suggests an urgent need for detailed research into the status of NTFPs in Swaziland:

1. *Insufficient collaboration and networking*: institutions involved in NTFPs statistics and analysis do not collaborate sufficiently with each other hence the information remains fragmented. Within the Ministry of Agriculture many sections are involved in various activities related to the NTFPs. In addition, the Ministry of Enterprise and Employment deals with handicrafts, the Ministry of Natural Resources and Energy deals with fuel wood, and the Ministry of Environment, Tourism and Communications work on eco-tourism and biodiversity issues. The Private Sector works on certain NTFPs, such as the Big Game Parks. Currently it is quite difficult for these role players to collaborate and coordinate their activities (DANCED,

2000b). This research aims at calling for a stakeholders' forum on NTFPs to open room for collaboration and networking.

2. *Lack of national focal point on NTFP statistics*: the proposed research study will strive to recommend the establishment of a national focal point for NTFPs at the Ministry responsible for forestry (Hassan *et al.,* 2002).

3. *Weak capacities*: the forestry department currently has inadequate and limited human and financial resources to carry out a resource inventory and economic analysis of NTFPs. This study is one avenue of conducting advanced research (GOS, 2002a).

4. *Poor stakeholder involvement*: statistical data are mainly gathered by government departments. The industry and the communities are often not involved though they possess relevant information. There is a strong need for a participatory approach where the communities are involved in resource inventories and surveys taking place in adjacent forests. This will enable them to voice their views in terms of sustainable management and utilization issues (GOS, 2002a).

5. *Inadequate research*: little research has been carried out to improve availability of NTFPs statistics; therefore there is a need for more detailed baseline studies (DANCED, 2000b; Hassan *et al.,* 2002).

6. *Incomplete and poor quality data*: statistical data on edible and medicinal products cover only a limited number of the NTFPs groups. The current study aims at looking into a broad spectrum of the edible and medicinal plant and animal products. Available information is unclear, inconsistent and contradictory (Dlamini, 1999; DANCED, 2000b).

7. *Weak data storage/process facilities*: most statistical data on NTFPs are not yet stored and analysed in specific electronic databases (Dlamini, 1999; Hassan *et al.,* 2002). The Forestry Research Division of the government's Forestry Department will get the opportunity to develop and establish a computerised storage system for data on NTFPs through this research study.

8. *Inadequate methodologies*: appropriate methodologies to collect and analyse relevant key information on NTFPs are non-existing in Swaziland (Dlamini, 1999; Hassan *et al.,* 2002). This study will review literature from regional and international centres

and tailor-make methodologies relevant to local conditions. Original research on economic valuation of NTFPs for inventory and flow values of preferred species was never done in Swaziland before (DANCED, 2000b). Therefore, this study is the first step towards valuation of NTFP in Swaziland and will form the basis for NTFPs resource assessment and economic valuation.

1.4 OBJECTIVES OF THIS RESEARCH

Below is an outline of the overall and specific objectives of this study:

1.4.1 Overall objective

To determine the socio-economic use, direct use values and management of natural forests and woodlands for edible and medicinal non-timber forest products in the four ecological zones of rural Swaziland as a basis for improvement of policy and strategy for the sustainable management of non-timber forest products.

1.4.2 Specific Objective 1

To review and assess the relevance of existing policies and legislation that affects the NTFPs sector in Swaziland.

1.4.3 Specific Objective 2

To review the current status of the NTFP sub-sector: to highlight past NTFPs valuation studies in Swaziland; to compile an up-to-date list of major use categories of NTFPs; and to rank NTFPs species in their order of importance.

1.4.4 Specific Objective 3

To embark on community consultations to gather information on the communities' perception of preferred edible and medicinal NTFPs, their direct uses, the existing management strategies, threats to forest biodiversity and the domestication and commercialisation initiatives.

1.4.5 Specific Objective 4

To undertake user surveys to determine the actual quantities of harvested and utilized edible and medicinal NTFPs, and to do an economic analyses of their direct use values.

1.4.6 Specific Objective 5

To conduct resource surveys to assess the condition and actual quantities of standing stock of species for edible and medicinal non-timber forest products, and to do an economic analysis of the value of the standing stock.

1.4.7 Specific Objective 6

To formulate and develop a theoretical framework for the sustainable management of NTFPs in natural forests and woodlands.

1.5 DESCRIPTION OF SWAZILAND AND THE STUDY AREAS

1.5.1 Location and Physiography

Swaziland lies between latitudes 25 and 28^0S and 30 and 33^0E in the south-eastern part of Africa and covers an area of 17 364 km^2. The country is landlocked and bounded by South Africa in the North, West and South and by Mozambique on the East. Although Swaziland is small in size, it has great variation in landscape, geology and climate. It also lies within the Maputoland Centre, an area reported to be one of the highly ranked spots that house the greatest biodiversity in southern Africa (GOS, 1997). Very little is known about forest resources in Swaziland outside the plantations. Information on past and present utilisation and values of indigenous forests is limited. However, it should be noted that this information is vital in designing and implementing appropriate forest policies and legislation (GOS, 2002a).

Historically the country is divided into four ecological zones, which have been modified into the following six physiographic zones (GOS, 1997):

- The Swaziland Highveld (33%) is the upper part of an overall escarpment, comprising complex steep slopes between low and high levels, dissected plateaux, plateau remnants, and associated hills, valleys and basins.

- The Upper Middleveld (14%) consists of strongly eroded plateau remnants and hills at intermediate level of the overall escarpment. It also has structurally defined basins in relatively protected positions, which are only weakly eroded.
- The Lower Middleveld (14%) is a piedmont zone of the escarpment, with generally strongly eroded foot slopes. The slopes are mostly moderate and the zone classifies at the first level as a plain.
- The Lowveld plain comprises sedimentary and volcanic Karroo beds as opposed to the igneous and metamorphic rocks of the Highveld and Middleveld. The Lowveld is subdivided into the higher Western Lowveld (20%) on sandstone or claystone and the lower Eastern Lowveld (11%) on basalt.
- The Lubombo Range (8%) is a cuesta with a steep escarpment bordering the Eastern Lowveld and a gradual dip slope of about 5% descending east. As a major landform the Lubombo qualifies as a plateau.

The main characteristics of the six physiographic zones, including, landforms, altitude, geology and vegetation types, are provided in Table 1.1, and their location is shown in Figure 1.2.

Table1.1: Physiographic Zones of Swaziland

PHYSIOGRAPHIC ZONE	ALTITUDE (m)	LANDFORM & TOPOGRAPHY	GEOLOGY	VEGETATION TYPE
Highveld 5 680 km^2 (33%)	900-1400	Hills on steeply dissected escarpment with transitions to plateaux	Granite-gneiss, lava, quartzite	Short grassland with evergreen forest patches
Upper Middleveld 2 420 km^2 (14%)	600-800	Hills with plateau remnants and basins	Granodiorite/Granite-gneiss, shale	Tall grassland with scattered trees and shrubs
Lower Middleveld 2 420 km^2 (14%)	400-600	Rolling Plain with basins and isolated hills	Gneiss-granite/granodiorite	Broad-leaved savanna
Western Lowveld 3 410 km^2 (20%)	250-400	Undulating Plain	Sandstone/Claystone-dolrite intrusions, granite/granodiorite	Mixed savanna
Eastern Lowveld 1 960 km^2 (11%)	200-400	Gentle undulating Plain	Basalt	Acacia savanna
Lubombo Range 1 480 km^2 (8%)	250-600	Undulating Plateau with steeply dissected escarpment	Ignibrite	Hillside bush and plateau savanna

Source: Remmelzwaal and Vilakati, 1994.

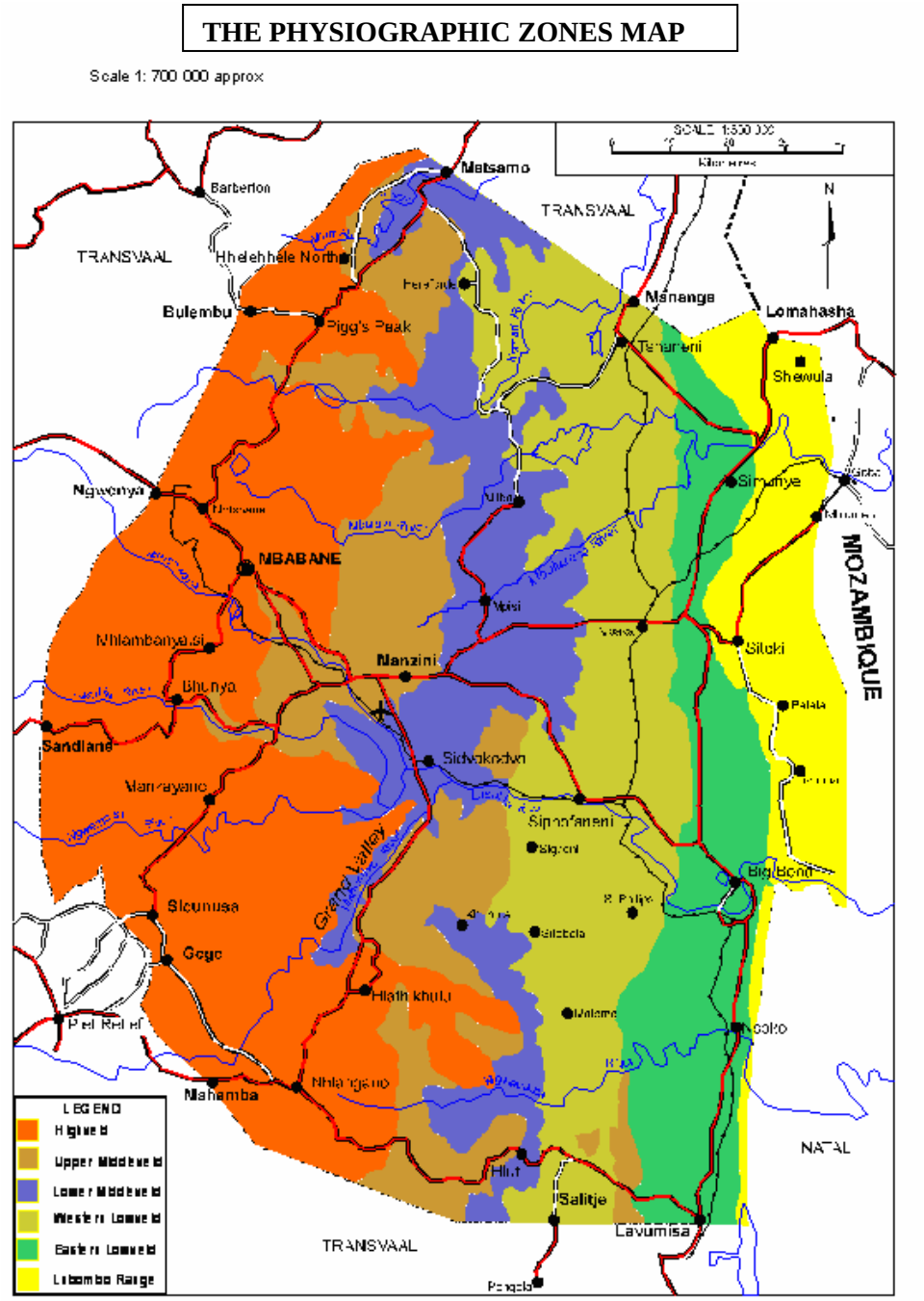

Figure 1.2: A map of Swaziland showing the location of the 6 physiographic zones
(Source: Remmelzwaal and Vilakati, 1994)

1.5.2 Climate

Swaziland has a sub-tropical climate with summer rains (with 75% in the period between October and March) and distinct seasons. The four ecological zones show clearly different climatic conditions ranging from sub-humid and temperate in the Highveld to semi-arid in the Lowveld. The country lies at the transition of major climatic zones, as it is influenced by air masses from different origins: equatorial convergence zone, sub-tropical eastern continental

moist maritime (with occasional cyclones), dry continental tropical and marine west Mediterranean (winter rains, with occasional snow) (GOS, 1997).

Table 1.2 gives an overview of some of the most relevant climatic conditions based on long-term averages. The mean annual rainfall ranges from 1450 mm in the Highveld to 550 mm in the Lowveld, but conditions vary considerably from year to year. For example, the Lowveld can experience years of lower than normal rainfall that leads to frequent drought. Rainfall figures of the zones are overlapping as a result of the overall higher rainfall in the northern part of the country. The mean temperatures shown in Table 1.2 are zonal averages. Major differences are experienced only in the Highveld and the Lubombo zones.

Table 1.2: Climatic data of Swaziland

Physiographic zone	Mean Temperatures ^{0}c			Rainfall (mm)		Koeppen Class.
	Annual	Jan.	July	Mean Annual	Depend (80%)	
Highveld	17	20	12	850-1400	700-1200	Cwb
Upper Middleveld	20	24	15	800-1000	650-850	Cwa
Lower Middleveld	21	25	16	650- 800	500-700	Cwa
Western Lowveld	22	26	18	625-725	425-550	BSh
Eastern Lowveld	22	27	17	550-625	400-500	BSh
Lubombo Range	21	26	17	700-825	500-750	Cwa

Source: Remmelzwaal and Vilakati, 1994.

Where:

Cwb represents warm temperate rainy (C), with a dry season winter (w) and a cool summer (b: warmest month below 22^0C);
Cwa is the same as Cwb except that it has a hot summer (a: warmest month over 22^oC) found in the Upper Middleveld, Lower Middleveld and Lubombo;
BSh being a dry-hot steppe climate found in the Western and Eastern Lowveld.

1.5.3 Soils

Soils in Swaziland have developed over long periods of time and they are divided into two groups. The first group consists of old soils formed on deeply weathered rock (saprolite), often tens of meters deep. The second group comprises relatively young soils that formed on eroded rock or alluvial deposits.

The deeply weathered soils of the Highveld and the Upper Middleveld are classified as *Ferrasols* and *Acrisols, c*haracterized by an acid soil reaction, high clay contents, a low cation exchange capacity (CEC) of the clay, a low base saturation and deep saturation and deep red colours. Other soils of the Highveld include *Leptosols, Regosols* and *Histosols* on eroded land as well as *Fluvisols* and *Gleysols* on alluvial deposits. The soils of the Lower Middleveld and Lowveld are generally only moderately weathered and show a wide range of soil

characteristics, depending on parent material, position, and erosion. They include *Vertisols, Planosols, Solonetz, Lixisols, Luvisols, Phaeozens, Cambisols, Arenosols, Rogosols* and *Leptosols*. All these soils have a neutral or basic soil reaction, a high base status and a medium or high CEC clay values. Textures, however, and some other properties such as colour and structure show a wide variation. *Nitisols* of the Lubombo (Lomahasha area), one of the best soils in the country, are characterized by shiny structural ped faces, intermediate CEC, relatively high base saturation and high clay contents (GOS, 1997).

1.5.4 Population growth and culture

The last census report of 1986 (GOS, 1997) showed a population growth of 3.4% per annum and the estimated current population of Swaziland is 1.1 million as at 1997. About 47% of the population is people under 15 years old, indicating an extremely high dependency ratio. Households are expected to increase and the cost of social services and infrastructure will be increasingly borne by a smaller group than the direct user group. It is however important to note that all these speculations did not consider the adverse effects of the HIV/AIDS pandemic that is currently sweeping the country from rural to urban areas at an alarming rate. At present 25% of the population live in urban areas, while 69% are on Swazi Nation Land, with 6% on individual tenure farms. Rural to urban migration is at the rate of 3-5%, and is expected that by 2030, about 70% of the total population will be living in urban areas. There are about 88 000 households, with more than a third headed by women (GOS, 1997).

Swaziland has a dualistic system of traditional and modern lifestyles that accommodates all forms of economic, social and political interactions. The traditional practices and customs provide cohesiveness and a strong sense of cultural identity. Some traditional practices have lead to loss of biodiversity, such as hunting for the men's traditional attire and the heavy reliance on natural medicinal plants. Fortunately the new Swaziland Environmental Action Plan and the National Biodiversity Strategy and Action Plan and other related sectoral policies and laws are already in place to deal with such cases (GOS, 1997).

1.5.5 Socio-economy

Swaziland's economy is closely tied to that of neighbouring South Africa. This is as a result of Swaziland's membership to the South African Customs Union (SACU) from which the country gets about half of its government revenues. The country is also a member of the Common Monetary Area (CMA). Approximately 80% of Swaziland's imports are from South

Africa and about 60% exports go to South Africa (GOS, 1997; DANCED, 2000b; Hassan *et al* 2002).

The country comprises a traditional subsistence sector and a modern, capital-intensive sector, which is mainly foreign controlled. Local participation is through equity shareholding through Tibiyo Taka Ngwane, a national investment fund held in trust of the Swazi nation by His Majesty King Mswate the III. Economic growth declined from an average of 4% in 1989-95 to 2.8% in 1995-96, which is less than the population growth rate of 3.4% (GOS, 1997). This means that on the average GDP per capita is decreasing and the people are getting poorer. This decline is partly due to persistent drought, the prevalent economic recession, the lifting of sanctions in South Africa and the negative impacts of the HIV/AIDS pandemic in the country.

1.5.6 Major land uses

Land is the most important resource in Swaziland considering the resources that are associated with it like soils, flora and fauna, surface water and minerals. The majority of the population derive their livelihood from the land, and issues of land ownership, use and management systems are an integral part of day-to-day existence of the society (GOS, 1997).

Up to date information on the present land use is a requirement for the planning and implementation of local and national level programmes and projects related to land and environment. Table 1.3 displays an overview of the present major land uses in Swaziland based on the inventory available at scale 1:250 000 (Remmelzwaal and Vilakati, 1994).

Table 1.3: Major land uses in Swaziland

Code	Groups	Km^2	%
SA	Small-scale subsistence crop agriculture (rainfed annual field cropping)	2140	12.3
LA	Large-scale commercial crop agriculture (irrigated and rainfed field/tree cropping)	1040	6.0
CH	Extensive communal grazing	8670	50.0
RH	Ranching	3320	19.1
F	Plantation forestry	1400	8.1
P	Parks, Wildlife Management	670	3.9
S	Residential, Industry, Recreation	80	0.5
W	Water Reservoirs	40	0.2
		17360	**100**

Source: Remmelzwaal and Vilakati (1994)

It should be noted that the figures in Table 1.3 are gross figures. Substantial reductions have to be applied to get net percentages. For example, with the use of about 33.3% of the area under subsistence cropping for grass strips and infrastructure, the estimated net percentage becomes 9% and not 12.3%.

1.5.7 Land tenure

Land tenure is an important factor in the role of management of land, including utilisation and conservation of non-timber forest products. The history of land tenure in Swaziland is complex. There are three main categories of land tenure: Swazi National Land (SNL), Crown Land and Private Freehold or Title Deed Land (TDL). A fourth category of Concession Land is considered minor and not well defined. Swazi Nation Land is held in trust by the King for the Swazi Nation, while Crown Land is land over which Government holds title. Table 1.4 summarizes the main tenure categories based on a national inventory (Rammelzwaal and Vilkati, 1994).

1.5.8 Forest cover

In terms of forest cover Swaziland is endowed with eight main groups of vegetation strata (forest types) that are further stratified into 13 sub-groups (DANCED, 2000a,b). These are: Montane and Highland (Dense and Open); Riverine Forest; Mixed Woodland (Dense and Open); Acacia Woodland (Dense and Open); Dry Acacia Woodland (Dense and Open); Indigenous Bushveld (Dense and Open); Wattle Forest; and Plantations. The total forest area in 1999 was estimated at 789 000 ha (45% of the country) and more than 80% of forest area is indigenous forest (DANCED, 2000b). Appendix 1 gives the overview of the extent and distribution of forest and woodland resources in Swaziland as described above. The latest forest statistics show that the forest coverage stands at natural forests-3.2%, natural woodlands-22%, natural bushveld-13.4%, wattle-1.4%, plantations-6.4% to make up 45% of the country's total land area (DANCED, 2000b; Hassan *et al.,* 2002*;* GOS, 2002 b). Species frequencies and diameter class per stratum are presented by DANCED (1999), and for details refer to Appendix 2.

Table 1.4: Land Tenure Types in Swaziland

CODE	LAND TENURE TYPE	Km^2	%
SS	**Swazi Nation Land, sensu stricto**		
	▪ Controlled by chiefs, communal	8470	48.8
	▪ Controlled by chiefs, non-communal	140	0.8
	▪ Controlled by Tibiyo Taka Ngwane	80	0.5
	▪ Leased to companies or individuals	140	0.8
	Subtotal	**8830**	**50.9**
SP	**Swazi Nation Land, purchased**		
	▪ Controlled by chiefs, communal	1010	5.8
	▪ Controlled by Tibiyo Taka Ngwane	420	2.4
	▪ Controlled by National Trust Commission	460	2.6
	▪ Leased to companies or individuals	980	5.7
	▪ Controlled by Ministry of Agriculture	1180	6.8
	Subtotal	**4050**	**23.3**
TU	**Title Deed Land, urban area**	130	0.7
TR	**Title Deed Land, rural area**	4240	24.4
CL	**Crown Land**	70	0.4
	Water Reservoirs	40	0.2

Source: Remmezwaal and Vilakati, (1994).

CHAPTER 2: ASSESSMENT OF THE RELEVANCE OF EXISTING POLICIES AND LEGISLATION THAT AFFECT THE NTFP SECTOR IN SWAZILAND

2.1. INTRODUCTION

Experience of many countries illuminated that conservation and development strategies are only effective if policy development is supported by legally binding norms. Among the many legally binding norms, the formulation of laws and legislation are central. The process of formulating and implementing policy and law should be a single continuum. In Swaziland, a new National Forest Policy was developed and formulated between 1998 and 2002, through technical cooperation of the DANCED, yet to date there is only a draft Forest Act. This deterred the effective implementation of the National Forest Policy. In addition, there are also several functional policies, mostly draft, that are relevant to the forest sector (DANCED, 2000b; GOS, 2002a). This study briefly reviewed those policies. A detailed analysis of all relevant functional policies needs to be done within the framework of the new national forest policy. These functional policies contain elements that may be of relevance to the NTFP sector, depending on how they are implemented (DANCED, 2000b).

Swaziland has signed and ratified a number of important international conventions, and has used substantial funds to produce draft policies and plans within the areas treated by these conventions (DANCED, 2000b; GOS, 2001a, 2002a). However, none of these conventions has a comprehensive approach to NTFP development (DANCED, 2000b). Existing legislation regarding NTFPs in Swaziland is deficient (DANCED, 2000b; Hassan *et al.*, 2002). Several regulations relevant to NTFPs are scattered across many different laws. Much of the legislation is obsolete and do not guide the effective implementation of natural resource policies. Currently, there are ongoing reviews and analysis of existing policies and legislation to assess their capacity in dealing with contemporary challenges of sustainable use and management of NTFPs at a global scale. This is mainly due to the rapid rise in loss of forest biodiversity regardless of the presence of policies and legislation (Bhattari and Hammig, 1998; FAO, 2003a).

Planning the management and utilization of natural forests and woodlands by a wide variety of stakeholders, who often have conflicting interests in these natural and environmental resources, poses a great challenge to governments and development agencies and interested and affected parties (Sumaila *et al*., 2001).

A strategy to reconcile the needs and priorities as well as demands of households, the private sector and government on natural forests and woodlands was developed by Nhantumbo and

Kowero (2001) (a goal programming model for planning the management of miombo woodlands). This ultimately helps for planning management and use of natural forests and woodlands, and serves as a framework for policy analysis. In addition, Sumaila *et al*. (2001) developed a system dynamic model called MIOMBOSIM, which has the potential for facilitating planning developments in natural forests and woodlands in such a way that needs and priorities of local communities, government and the private sector are reconciled. The model has the capacity to analyse various policy implications on people and natural forests and woodlands.

2.2 SPECIFIC OBJECTIVE

To review and assess the relevance of existing and draft policies and legislations that affects the NTFP sector in Swaziland.

2.2.1 Associated Research Questions

- ✓ What is the impact of the existing nominal and functional national and international policies and legislation on the sustainable management of edible and medicinal NTFPs?
- ✓ Which of the national level criteria and indicators for sustainable forest management are appropriate and relevant to the sustainable management of NTFPs?
- ✓ Are there existing institutional networks or is there any form of formal collaboration between the institutions responsible for implementing the various national and international policies and legislation that affect the NTFPs?

2.2.2 Hypothesis to be tested

Hypothesis: The current National Forest Policy does not adequately guide the development of NTFPs

2.3 METHODS

A hierarchical method of policy and legislation review and analysis devised to test the above hypothesis will be used, after Lamb (1983), Bhattarai and Hammig (1998) and EC-FAO Partnership Programme (2002). The stages followed are detailed as follows:

2.3.1 Step one: Preliminary selection of relevant policies and legislation

An inventory was made of existing national policies and programmes, national legislation and international conventions that affect the natural resource management sector, to generate a policy information pool for analysis. Relevance to the National Forest Policy and the National Environmental Policy was a central criterion to select the policies and legislation for analysis.

2.3.2 Step two: First assessment of all selected policies and legislation

A matrix was produced to assess whether the various policies and legislation includes relevant elements of NTFPs in their details. A 'YES' was denoted by 1 to those that included elements of NTFPs and a 'NO' was denoted by a 0 to those that never included any traces of information on NTFPs.

2.3.3 Step three: Second assessment of all selected policies and legislation

A further screening was carried out within the shortlist resulting from step two above. This helped to select only those policies and legislation that deal directly with more than one category of NTFPs. This study did not revise and analyse those policies and legislation that remotely or indirectly address NTFPs. A matrix was engaged and those policies and legislation dealing directly with NTFPs were given a '1' for 'YES' and a '0' for 'NO'.

2.3.4 Step four: Third and final assessment of short-listed policies and legislation

A review and analysis of selected policies and legislation (those receiving a YES in step three above) was carried out in the context of the following 21 Issues/Elements, which were adapted and modified from many authors. Lamb (1983), Falconer (1992), FAO (1995, 2001, 2003a,b), Crafter *et al*., (1997), Bhattarai and Hammig (1998), DANCED (2000b, 2001), GOS (1999), Mogaka *et al*., (2001), Barrow *et al.,* (2002), Geldenhuys (2002), Hassan *et al*., (2002), Clarke and Grundy (2004), Lawes *et al.,* (2004), Shackleton and Shackleton (2004, 2005), Janse and Ottisch (2005), Emanuel *et al*., (2005) and Olsen (2005) were the main scientific papers consulted at this stage. Below is an outline of the comprehensive list of issues and criteria for policy and legislation review and anlyisis:

1. Stakeholder involvement in the development and implementation processes
2. Economic incentives in the sustainable management of NTFPs
3. Existing gaps and overlaps within and between selected policies and legislation

4. A broad spectrum of NTFPs covered
5. Decentralization of power in the management of NTFPs
6. Approaches to sustainable management of NTFPs
7. Schedules of priority species for NTFPs
8. Red Data List status of NTFPs species
9. Flora Protection Act status: rare, endangered, threatened, or extinct in the wild
10. Recommended strategies to combat unsustainable utilization of NTFPs and to promote sustainable resource use and management
11. Issues of commercialisation and domestication of NTFPs
12. Implementability: Is there a clear action plan or implementation plan?
13. Status: Are the selected policies and legislation contemporary or outdated?
14. Elements of the impact of Alien Invasive Plants on NTFPs
15. Periodical ethnobotanical surveys, user surveys and resource surveys for NTFPs, and impact of harvesting of NTFPs
16. Trade chains and value adding processes to NTFPs
17. Valuation of NTFPs: flow value and inventory value (standing valueas observed in resource inventory)
18. Role of NTFPs in forest conservation: integrated forest management
19. Scientific understanding of the dynamics of the ecology and socio-economics of NTFPs
20. Training: recognize and strengthen the role of local people in inventory, research, monitoring and impact assessment processes, and management of NTFPs
21. Collaboration and networking of all institutions dealing with NTFPs at local, national, regional and international levels

The short-listed policies and legislation for review and analysis are graded against the above 21 issues in the following manner:

1. If the issue is adequately addressed, 2 points are given
2. If the issue is not adequately addressed, 1 point is given
3. If the issue is not addressed at all, 0 point is given

An issue was considered as adequately addressed when issues and policy statements are given about it or when issues and remedial measures are highlighted about it.
An issue was considered not adequately addressed if it mentioned relevant issues but without any further details.

An issue was considered not addressed if the issue is totally absent in the policy and legislation document.
The maximum score per row is 42 points. All policies and legislation were graded over 42 points.

2.4 RESULTS

2.4.1 Preliminary selection of relevant policies and legislation

The inventory of policies and legislation potentially relevant to natural resource management gave nine national policies/strategies, 15 Acts and 11 international principles (Table 2.1). Tables 2.2, 2.3 and 2.4 show the screening process of policies and legislation.

2.4.2 First and second assessments of selected policies and legislation

The screening process indicated that the existing national and international policies and legislation addressed NTFPs differently; some adequately and some inadequately. There are national policies that contain elements of NTFPs, and deal with them directly, while some deal with them indirectly. Furthermore, some policies and legislation do not contain elements of NTFPs yet they deal with them indirectly. Only policies and legislation with 2 points and are dealing or covering more than one category of NTFPs were selected for the final analysis. This means the Wattle Bark Act, Protection of Wild Birds Act, Grass Fire Act and Protection of Freshwater Fish Act were discarded. However, they still are a very important component of NTFPs legislation though they were not considered for the final assessment.

2.4.3 Third and final assessmentof short-listed policies and legislation

Table 2.5 and Table 2.6 show the existing national and international policies and legislation that address NTFPs to varying degrees The international conventions scored the highest points, because they cover a broad spectrum of important and key issues on the development and sustainable management of NTFPs. National policies scored second highest points. The new contemporary policies and national level criteria and indicators for sustainable forest management cover issues and elements of NTFPs. The national legislation scored the lowest and confirms the view that they are outdated. The findings also attest that those national legislation are orientated to promote preservation, not sustainable use, and as result difficult to implement. Preservation of natural environmental resources hinders their development and

Table 2.1: The three groups of policies and legislation selected for preliminary review and analysis

(1) National policies/strategies	(2) National legislation	(3)International principles
National Forest Policy (GOS, 2002a)	Forest Preservation Act, 1910 (GOS, 1910)	Millenium Development Goals
National Programme for CCD (Convention to Combat Desertification)	Wild Birds Protection Act, 1914 (GOS, 1914)	The World Bank Forest Strategy/Policy and Forest Certification
National Biodiversity Strategy and Action Plan (GOS, 2001a)	Swazi Administration Order, 1998 (GOS, 1998)	The Environmental Initiative of New Partnership for Africa Development (NEPAD)
Swaziland Environmental Action Plan (GOS, 1997)	Private Forest Act, 1951 (GOS, 1951a)	SADC Policy and Strategy for Environment and Sustainable Development
National Environmental Policy (GOS, 1999)	Natural Resources Act, 1951 (GOS, 1951b)	SADC Forestry Protocol
National Tourism Policy (GOS, 2000a)	Flora Protection Act, 2001(GOS, 2001b)	UNCED Agenda 21 (UNCED, 1992)
National Land Policy (GOS, 2000b)	Grass Fire Act, 1955 (GOS, 1955)	Convention on Biological Diversity (UNEP, 1992a)
National Energy Policy (GOS, 2001c)	Game Act, 1953 (GOS, 1953)	Convention to Combat Desertification (UNEP, 1995)
National level Criteria and Indicators for Sustainable Forest Management (GOS, 2001d)	Wattle Bark Act, 1960 (GOS, 1960)	United Nations Framework Convention on Climate Change (UNEP, 1992b)
	Control of Tree Planting Act, 1972 (GOS, 1972)	Convention on International Trade of Endangered Species of Flora and Fauna (UNEP, 1975)
	National Trust Commission Act, 1972 (GOS, 1973)	Ramsar Convention on Wetlands
	Plant Control Act, 1981 (GOS, 1981)	
	Swaziland Environmental Authority Act, 1992 (GOS, 1992)	
	Swaziland Tourism Authority Act, 2001 (GOS, 2001e)	
	Protection of Freshwater Fish Act, 1937 (GOS, 1937)	

Table 2.2: The Matrix of International Principles and Conventions (First and second assessments)

International Convention/Principles	Elements of NTFPs YES=1; NO=0	Deal with NTFPs YES=1; NO=0
Millenium Development Goals	1	1
The World Bank Forest Strategy/Policy and Forest Certification	1	1
The Environmental Initiative of New Partnership for Africa Development (NEPAD)	1	1
SADC Policy and Strategy for Environment and Sustainable Development	1	1
SADC Forestry Protocol	1	1
UNCED Agenda 21	1	1
Convention on Biodiversity	1	1
Convention to Combat Desertification	1	0
United National Framework Convention on Climate Change	0	0
Convention on International Trade of Endangered Species of Flora and Fauna	1	1
Ramsar Convention on Wetlands	1	0

Table 2.3: The Matrix of national policies (First and second assessments)

National policy/Programme	Elements of NTFPs YES=1; NO=0	Deal with NTFPs YES=1; NO=0
National Forest Policy	1	1
National Programme for Convention to Combat Desertification	0	0
National Biodiversity Strategy and Action Plan	1	1
Swaziland Environmental Action Plan	0	0
National Environmental policy	1	1
National Tourism Policy	0	0
National Land Policy	0	0
National Energy Policy	1	1
National level Criteria and Indicators for Sustainable Forest Management	1	1

Table 2.4: The Matrix of national legislation (First and second assessments)

National Legislation	Elements of NTFPs YES=1; NO=0	Deal with NTFPs YES=1; NO=0
Forest Preservation Act	1	1
Wild Birds Protection Act	1	1
Swazi Administration Order	0	0
Private Forest Act	1	0
Natural Resources Act	0	0
Grass Fire Act	1	1
Flora Protection Act	1	1
Game Act	1	0
Wattle Bark Act	0	1
Control of Tree Planting Act	1	0
National Trust Commission Act	0	1
Plant Control Act	1	1
Swaziland Environmental Authority Act	1	0
Swaziland Tourism Authority Act	0	0
Protection of Freshwater Fish Act	0	1

sustainable use. The assessment by this study clearly shows that the new national programmes are in line with international principles on sustainable use and management of NTFPs.

2.5 OVERVIEW OF THE RELEVANCE OF SELECTED POLICIES AND LEGISLATION TO NTFPs

2.5.1 International Conventions and Principles

1. Millenium Development Goals: Forestry

After the Millennium Summit of 2000, the agencies of the United Nations, the World Bank, the International Monetary Fund, and the Organisation for Economic Co-operation and Development drafted a concise set of Millenium Development Goals (MDGs). The Millenium Development goals consist of eight objectives, with each having one or more quantifiable targets and indicators that serve as milestones to monitor and evaluate the progress (The Millenium Development Goals, 2005). These goals can be summarized as follows:

Table 2.5: Detailed breakdown of the scores and ranking against NTFPs issues and elements for the selected international policies and legislation

International Policies and legislation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Grand Scores	Ranking
Convention on Biodiversity	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	42	1
SADC Forestry Protocol	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	41	2
UNCED Agenda 21	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	40	3
Millennium Development Goals	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	2	2	2	2	2	2	38	4
The Environmental Initiative of New Partnership for Africa Development (NEPAD)	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	2	2	2	2	2	2	38	4
SADC policy and strategy for Environment and Sustainable Development	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	2	2	2	2	2	2	38	4
The World Bank Forest Strategy/ Policy and Forest Certification	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	2	2	2	1	2	2	37	5
Convention in International Trade of Endangered Species of Flora and Fauna	1	1	2	2	1	1	2	2	2	2	2	2	2	1	2	2	2	0	1	1	1	33	6

Legend Keys: Issue adequately addressed= 2; Issue inadequately addressed=1; Issue not addressed=0

The 21 Issues and elements of NTFPs:

1. Stakeholders involvement	7. Schedules of species	13. Status of policy	19. Scientific understanding
2. Economic incentives	8.Red data list	14. Impact of Alien Invasive species	20. Training
3. Existing gaps	9. Flora Protection	15. Ethnobotanical Surveys	21. Collaboration
4. Broad spectrum	10. Strategies for sustainable management	16. Trade Chains	
5.Decentralisation	11. Commercialization and domestication	17. Valuation of NTFPs	
6. Sustainable Management	12. Implementability	18. Integrated Forest Management	

Table 2.6: Detailed breakdown of the scores and ranking against NTFPs issues and elements for the selected national policies and legislation

National Policies and legislation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**Grand Scores**	**Ranking**
National Biodiversity Strategy & Action Plan	0	0	1	2	1	1	2	1	1	2	2	2	2	2	2	2	2	1	2	1	1	30	1
Criteria and Indictors for Sustainable Forest Mgt.	1	0	2	2	1	1	0	0	1	2	2	2	2	2	2	2	2	0	2	2	2	30	1
National Environment Policy	0	1	1	2	1	1	0	1	1	2	2	2	2	2	2	2	2	1	2	1	1	29	2
National Forest policy	1	1	1	2	1	1	0	0	1	2	2	2	2	2	2	2	2	0	2	1	1	28	3
Game Act	1	1	0	2	0	0	2	0	0	2	2	1	1	0	2	2	2	0	0	1	0	19	4
Plant Control Act	0	0	0	1	0	0	2	0	2	1	1	0	0	2	0	0	0	0	1	0	0	10	5
Forest Preservation Act	0	0	0	1	0	0	0	1	1	0	0	1	1	1	0	1	1	1	0	0	0	9	6
National Trust Commission Act	0	0	0	1	0	0	0	0	0	1	1	0	0	1	1	1	1	0	0	1	0	8	7

Legend Keys: Issue adequately addressed= 2; Issues inadequately addressed=1; Issue not addressed=0

The 21 Issues and elements of NTFPs:

1. Stakeholders involvement	7. Schedules of species	13. Status of policy	19. Scientific understanding
2. Economic incentives	8. Red data list	14. Impact of Alien Invasive species	20. Training
3. Existing gaps	9. Flora Protection	15. Ethnobotanical Surveys	21. Collaboration
4. Broad spectrum	10. Strategies for sustainable management	16. Trade Chains	
5. Decentralisation	11. Commercialization and domestication	17. Valuation of NTFPs	
6. Sustainable Management	12. Implementability	18. Integrated Forest Management	

1. Eradicate extreme poverty, 2. Achieve universal primary education, 3. Promote gender equality and empower women, 4. Reduce child mortality, 5. Improve maternal health, 6. Combat HIV/AIDS, malaria and other diseases, 7. Ensure environmental sustainability, and 8. Develop a global partnership for development.

While sustainable forest management and agroforestry can contribute to achieving all the eight MDGs, their contributions to achieve the projected goal 1 (eradicate extreme poverty and hunger), and goal 7: (ensure environmental sustainability) are the most relevant.

Actions necessary to achieve the various goals of the MDGs are presented below:

i. Proposed actions to achieve Goal 1:

1. Sustainable forest management and agroforestry;
2. Support local forest extension programmes that focus on local economic development;
3. Support local agroforestry extension programmes that promote adoption of new agroforestry systems and improvement of traditional agroforesty systems;
4. Support initiatives for the development of NTFPs;
5. Support the establishment of small-scale processing and value-adding industries at the community level;
6. Support community-based partnerships for sound forest stewardship as tools for realizing good local-level governance;
7. Support research and education related to sustainable forest management and agroforestry through the Centre for International Forest Research and World Agroforestry Centre.

ii Proposed actions to achieve Goal 7:

1. Establishment of greater cooperation and coordination among all key stakeholders in forestry issues;
2. Institutional strengthening (their mandates, human and material resources, political support);
3. Integrate policies and development plans; adopt multi-sectoral approach as seen in most contemporary National Forest Policies and National Forest Action Programmes worldwide;
4. Implement relevant and appropriate international conventions and agreements such as the Convention on Biodiversity, Convention to Combat Desertification and the Convention on Climate Change;

5. Implement the proposals for action of the UN Intergovernmental Panel on Forests and International Forum on Forests
6. Support initiatives that deal with environmentally sound watershed management;
7. Support monitoring initiatives on the expansion of forests and protection-worthy areas;
8. Support the establishment of forest plantations to meet the increasing global demand for wood, while also recognizing the environmental services of the world's natural forests;
9. Provide economic incentives to communities for natural forest conservation

iii. Proposed actions to achieve Goals 2, 3, 4, 5, and 6:

1. Support watershed management to improve sanitation and water supplies;
2. Support agroforestry to enhance food security and nutritional status;
3. Improve human health by adopting efficient, smoke-free cooking stoves and improved fuelwood/charcoal use;
4. Promote reforms on gender issues in forestry and agroforesty, thereby creating an enabling environment for more women participating;
5. Support public education campaigns that raise public awareness of the social, cultural, environmental, ecological and economic values of forests.

iv. Proposed actions to achieve Goal 8:

1. Support the activities of the International Model Forest Network;
2. Increase ODA commitments to sustainable forest management and agroforestry programmes;
3. Support national governments in formulation and implementation of national forest programmes;
4. Participate actively in the international forest policy dialogue, the deliberations of the UN Forum on Forests and other global fora;
5. Facilitate improved market access by promoting the adoption of forest certification procedures and practices at all levels (locally and nationally).

In summary, the sustainable management of forests and trees has a meaningful contribution towards achieving the MDGs. This is mainly in consideration of management, harvesting, processing and marketing of wood and NWFPs for income and employment, adoption of modern advanced agroforestry systems and improvement of traditional agroforestry systems

for enhancing food production and food security, providing wood products, providing household energy and improving soil fertility; watershed management in order to obtain a vast array of goods and services, particularly enhanced and sustained water production that is vital for health and sanitation; sustainable forest management that can protect biodiversity, moderate climate change and reverse desertification (The Millenium Development Goals, 2005).

2. The World Bank Forest Strategy/Policy and Forest Certification

In October 2002, the World Bank adopted a new Strategy and Operational Policy on forests. The most significant new measures of this policy are (The World Bank Forest Policy, 2005):

i. Allow for, and promote, the resumption of direct Bank funding of forestry operations, including in primary tropical rainforests. According to the Bank, "revisions to the Bank's Operational Policy on Forestry will permit the Bank to become proactive…in supporting improved forest management in production forests".

ii. Partly 'condition' Bank funding for forestry operations on independent certification. According to the Bank, "This new approach will require all forest harvesting and management operations financed by the World Bank to be monitored through independent assessment and certification authorities".

The key features of the new Operational Policy on Forests are:

- ✓ A focus on forests instead of forestry: the new policy applies to all Bank investment operations that potentially impact on forests. It also encourages the incorporation of forest issues in Country Assistance Strategies, the World Bank's business plans for engagement with countries, and addresses cross-sectoral impacts on forests;
- ✓ All forests are included: the new policy covers all types of forests, unlike the previous one that emphasized tropical moist forests only;
- ✓ All aspects of forest activity are covered: the policy includes specific requirements to address all key aspects of forest management, conservation and sustainable development, not just for conservation;
- ✓ Replacing preconditions with analysis: the bank will analyze the status of a country's forest policy and practices and determine the actions and processes necessary to bring about lasting improvements in forest conservation and development outcomes;

- ✓ Markets for full range of goods and services: the policy further provides recognition of the need to encourage the development of private sector market and marketing arrangements for the full range of environmental goods and services provided by forests;
- ✓ Targeted conservation: the current policy now makes provisions for conservation of critical natural habitats in all forest types. These provisions protect these critical forest areas from any investment that would lead to their degradation or conversion, and prohibits the Bank from financing of any commercial extraction or plantation development in critical natural habitats;
- ✓ Investment outside critical forest areas: a provision for investment support to improve forest management outside critical forest areas, with conditions to ensure that such bank financed operations comply with independent certification standards acceptable to the bank;
- ✓ Distinction between large scale and small scale activities: The same high standards of forest management will apply for both small and large scale systems. However with small scale landowners the monitoring will be done by the borrower with meaningful local stakeholder participation as opposed to formal certification requirements. Monitoring by government bodies, independent third parties and through the Bank's own supervision will provide the assurances that the forest operations benefit people most dependent on them while contributing to local economic growth and poverty alleviation.

The World Bank Forest Policy further states that the new Forest Strategy is founded, based on three interdependent pillars.

i. Harnessing the potential of forests to reduce poverty:

In collaboration with member countries the objectives of the new strengthened policy, institutional and legal frameworks to ensure the rights of people and communities living in and near natural forests and woodlands; to ensure that women, the poor and other marginalized groups in society are able to take a more active role in formulation and implementation of forest policies and action programmes; support the scaling up of collaborative and community-based forest management to help local people manage their own forest resources, freely market forest products and benefit from security of tenure; and work with local groups, NGO's and other partners to integrate forestry, agroforestry and small enterprises in rural development programmes..

ii. Integrating forests in sustainable economic development:

To support this pillar the Bank will: analyze and coordinate policies to ensure a cross-sectoral approach to sustainable forest management, conservation and development; support improved governance by restructuring and reviewing inappropriate policies and encouraging multi-stakeholder involvement in the development and implementation of forest policy and action programmes; help governments overcome corruption and other illegal activities through improved forest laws, regulations and enforcement, and through consumer-driven demand for forest products from legal sources; address finance, fiscal and trade issues related to the forest sector and forest products to enable governments to capture a higher portion of forest revenues for sustainable social and economic development; and promote catalytic investments in the full range of forest goods and services available from well-managed forests, only in areas outside critical forestry conservation areas.

iii. Protecting vital local and global environmental services and values:

The primary objective of the Bank, in all client countries, will be to help governments to identify and conserve critical forest areas in all forest types; help governments promote the wider scale adoption of responsible forest management practices in production forests outside critical forest conservation areas; develop options to build markets and finance for international goods and services such as biodiversity and carbon sequestration; help governments develop measures to mitigate and adapt to the anticipated impacts of climate change and reduce the vulnerability of the poor people to its effects; help governments design, implement and finance national markets for local forest goods and services; help governments in strengthening forest investments, policies and institutions, to minimize adverse indirect and cross-sectoral impacts of policy and investments on high conservation and protected areas; ensure that the Bank investments and programmes in both the forest sector and other sectors that could have detrimental effects on protected forests and associated/related natural habitats are implemented according to the Bank's operational policies and safeguards.

The Bank also identified the *modus operandi* for the effective implementation of the new approach. Realigning bank support, development of tools for practitioners and partnerships with other donors and national stakeholders, NGO's and the private sector are found among the recommened implementation strategies.

3. The Environmental Initiative of the New Partnership for Africa Development (NEPAD)

The overall objectives of the action plan are to complement relevant African processes including the African Ministerial Conference on Environment (AMCEN). The vision of this initiative is aligned with a view of improving environmental conditions in Africa in order to contribute to the achievement of economic growth and poverty alleviation, to build Africa's capacity to implement international environmental conventions and agreements; so as to effectively address the African environmental challenges in the context of the implementation of NEPAD (The New Parternship for Africa Development, 2005). The core programmatic areas and activities are listed as follows:

- ✓ Programme Area 1: Combating land degradation, drought and desertification;
- ✓ Programme Area 2: Conserving Africa's Wetlands;
- ✓ Programme Area 3: Preventing and Controlling Invasive Alien Species;
- ✓ Programme Area 4: Managing Coastal and Marine Resources;
- ✓ Programme Area 5: Combating Global Warming and Climate Change
- ✓ Programme Area 6: Cross-Border Conservation or Management of Natural Resources (freshwater, biodiversity, forests, and plant genetic resources).

4. SADC Policy and Strategy for Environment and Sustainable Devlopment

The SADC-wide environmental policy has the following major goals that are relevant to forestry (The SADC Policy and Strategy for Environment and Sustainable Development, 2005):

a. To protect and improve the health, environment and livelihoods of the people of southern Africa with priority to the poor majority;
b. To preserve natural heritage, biodiversity and life supporting ecosystems in southern Africa; and
c. To support regional economic development on an equitable and sustainable basis for the benefit of the present and future generations.

These goals may be effectively implemented through the complimentary and functional goals below:

- ✓ Strengthening the analytical, decision-making, legal, institutional and technological capacities for achieving sustainable development in Africa;
- ✓ Increasing public information, education and participation on environmental issues in southern Africa; and
- ✓ Expansion of regional integration and global cooperation on environmental and natural resources management for sustainable development.

The above environmental policy goals reinforce the new objectives set in the SADC Regional Policy and Strategy for Food, Agriculture and Natural Resources (FANR). The following four of the six main objectives in the new FANR strategy are directly related to environment and natural resources management (The SADC Policy and Strategy for Environment and Sustainable Development, 2005):

- ✓ Objective 2: "To ensure the efficient and sustainable utilization, effective management and conservation of natural resources";
- ✓ Objective 3: "To incorporate environmental considerations in all policies and programmes and to integrate the sustainable utilisation of natural resources with development needs";
- ✓ Objective 5: "To improve the living conditions of rural populations in SADC member states through increased income and employment derived from the efficient and sustainable use of agricultural and natural resources";
- ✓ Objective 6: "To ensure recognition of the value of natural resources so that they can contribute optimally to the welfare and development of all the people of the region";

These environmental policy goals also reinforce and support the overall regional objectives set out in the 1992 SADC Treaty in the following manner (The SADC Policy and Strategy for Environment and Sustainable Development, 2005):
Article 5, Objective 1 (a): "To achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the peoples of southern Africa and support the socially disadvantaged through regional integration."

Article 5 Objective 1 (g): "To achieve sustainable utilization of natural resources and effective protection of the environment."

5. The SADC Forestry Protocol

This protocol was built on the basic objectives of SADC which include achieving development and economic growth, poverty alleviation with the ultimate objective of its eradication, and achieving sustainable utilization of natural resources and effective protection of the environment. The protocol shall apply to all activities relating to development, conservation, sustainable management and utilization of all types of forests and trees, and trade in forest products throughout the region (The SADC Forestry Protocol, 2005). Of the 31 articles of the SADC Forestry Protocol, articles 2 to 5, and 8 to 22 are pertinent to sustainable forest management.

To achieve the various objectives of the protocol State Parties need to co-operate to undertake the following:

1. Assisting and supporting each other to address issues of common concern including deforestation, genetic erosion, climate change, forest fires, pests, diseases, invasive alien species, and law enforcement;
2. Facilitating the gathering and monitoring of information and the sharing and dissemination of information, expertise and technology concerning forests, forestry and forest industries, throughout the region;
3. Promoting respect for the rights of communities and facilitating their participation in forest policy development, planning, and management with particular attention to the need to the recognition and protection of traditional forest-related knowledge. Further on to that, development of adequate mechanisms to ensure the equitable sharing of benefits derived from forest resources and traditional forest-related knowledge without prejudice to property rights;
4. Establishing appropriate institutions and funding mechanisms to support the implementation of this protocol; and
5. Harmonising approaches to sustainable forest management, policy, legislation and enforcement, and issues of international concern.

6. The UNCED Agenda 21: International Forestry Principles

A set of principles emanate from the UNCED Agenda 21, entitled "Non-legally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests", and it deals with all basic aspects of forestry. The main emphasis of these principles is sustainable management and utilization of

forest resources to meet the social, economic, ecological, cultural and spiritual values for present and future generations (UNCED, 1992). The following are the 4 broad programmes on forestry under the UNCED Agenda 21 in Chapter 11:

- ✓ Sustaining the Multiple Roles and Functions of Forests: objectives include strengthening institutions, skills, expertise, and capabilities to formulate plans and implement policies;
- ✓ Protecting, Conserving and Sustainably Managing Forests: objectives include maintaining and expanding forests; devising national forestry action programs, conserving and sustainably managing forests; maintaining and increasing the biological, socio-cultural, ecological, climatic, and economic contributions of forests; and implementing the forest principles;
- ✓ Promoting Efficient Utilization and Assessment: objectives include recognizing the social, economic, and ecological values of forests; using forest resources efficiently, rationally, and sustainably; developing efficient and sustainable fuelwood and energy supplies; and encouraging ecotourism; and
- ✓ Planning, Assessment, and Periodical Evaluations: objectives include devising systems for assessment and periodic evaluations, and providing information to officials and communities.

The section of the UNCED Agenda 21 that is most relevant to NTFPs is Chapter 15 that comprises the following issues:

The objectives and activities in this chapter of the UNCED Agenda 21 are intended to improve the conservation of biological diversity and the sustainable use of biological resources, as well as to complement and support the Convention on Biological Diversity. The underlying factors for the need to conserve biological diversity emanate from recognizing that our planet's essential goods and services depend on the variety and variability of genes, species, populations and ecosystems (i.e. biological diversity is the basis of life on earth). Most of the earth's biological diversity comes from the natural ecosystems of forests, savannahs, pastures and rangelands, deserts, tundras, rivers, lakes and seas. Also botanical gardens and zoos are of great importance to biodiversity conservation.

A set of objectives of the UNCED Agenda 21 that are of utmost importance to the NTFP sector

i. Press for the early entry into force of the Convention on Biological Diversity, with the widest possible participation;
ii. Develop national strategies for the conservation of biological diversity and the sustainable use of biological resources;
iii. Integrate strategies for the conservation of biological diversity and the sustainable use of biological resources into national development strategies;
iv. Take measures for the fair and equitable sharing of benefits derived from research and development and use of biological and genetic resources, including biotechnology between the sources of those resources and those who use them;
v. Undertake country studies, as appropriate, on the conservation of biological diversity and the sustainable use of biological resources, including analyses of relevant costs and benefits, with reference to socio-economic aspects;
vi. Produce up-to-date world reports on biodiversity based on national assessments;
vii. Recognize and adopt traditional methods and indigenous technical knowledge of local communities, emphasizing the particular role of women, relevant to the conservation of biological diversity and the sustainable use of biological resources, and ensure the opportunity for the participation of those groups in the economic and commercial benefits derived from the use of such traditional methods and knowledge;
viii. Develop measures and arrangements to implement the rights of countries of origin of genetic resources or countries providing genetic resources, as defined in the Convention on Biological Diversity, particularly developing countries, to benefit from the biotechnological development and the commercial utilization of products derived from such resources.

The above set objectives, including others that are not mentioned here, should be implemented by Governments at appropriate levels consistent with national policies and practices. The implementation needs the cooperation of the relevant United Nations bodies and intergovernmental organizations, and with the support of indigenous people and their communities, non-governmental organizations and other groups, including the business and scientific communities. The implementation strategies also need to be consistent with the requirements of international law.

Agenda 21 scored highly when assessed in Table 2.5, and this was mainly because these set of international principles cover a major part in the highlighted elements of sustainable use and management of NTFPs at the local, national and international levels.

7. International Convention on Biological Diversity

Article 1 of the International Convention on Biological Diversity (CBD) states the objectives of the convention (UNEP, 1992a):

i. The conservation of biological diversity,
ii. The sustainable use of its components; and
iii. The fair and equitable sharing of the benefits arising out of utilising genetic resources, by appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies and by appropriate funding

All the articles of the CBD are directly or indirectly relevant to the forestry sector. The following Articles are of particular interest to the Non-timber Forestry Sector:

- ✓ Article 6: General measures for conservation and sustainable use, where the contracting party shall: (a) Develop National Strategies, Plans or Programmes for the conservation and sustainable use of biodiversity and (b) Integrate the conservation and sustainable use of biodiversity into relevant sectoral or cross-sectoral plans, programmes and policies.
- ✓ Article 7: Identify components of biological diversity important for its conservation and sustainable use with regard to the indicative list of categories set down in annex 1 of the Convention. These are 1. Ecosystems and habitats: containing high diversity, large numbers of endemic or threatened species, or wilderness; required by species; of social, economic, cultural or scientific importance; or which are representative, unique or associated with key evolutionary processes; 2. Species and communities which are: threatened; wild relatives of domesticated or cultivated species; of their medicinal, agricultural or economic value; or social, scientific or cultural importance; or other importance for research into the conservation and sustainable use of biological diversity, such as indicator species; and 3. Described genomes and genes of social, scientific or economic importance.
- ✓ Article 8: *In-situ* Conservation practices and programmes where genetic resources conserved or exist within their natural ecosystems and habitats within or outside protected areas.

- ✓ Article 9: *Ex-situ* Conservation practices and programmes where genetic resources are conserved outside their natural habitats.
- ✓ Article 10: Sustainable use of components of biodiversity; integrate consideration of the conservation and sustainable use of biological resources into national decision-making.
- ✓ Article 11: Each contracting party shall, as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.
- ✓ Article 18: Promotion of international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity, where necessary, through the appropriate international and national institutions.

The CBD has been rated amongst the best and well-structured international legislation with regard to addressing most of the critical and crucial elements of sustainable use and management of NTFPs (see Table 2.5).

8. The Convention on International Trade in Endangered Species of wild flora and fauna (CITES)

The CITES regulates the international trade of flora and fauna. Of particular relevance to forestry is the fact that it has schedules of threatened trees and plants. As a result, the trade in trees endangered by the timber industry to the extent of the Mahogany and Teak forests can now be regulated under this convention. Likewise, international trade in bushmeat and other threatened NTFPs species is under control through this legislation (UNEP, 1975).

Articles of CITES relevant to the NTFP sector:

- ✓ Article 2: Fundamental Principles of CITES which define three appendices of species:
- ✓ Appendix 1 includes all species threatened with extinction, which are or may be affected by trade. Ongoing trade in these species must be subject to strict regulation in order not to endanger further their survival and must only be allowed in exceptional cases.
- ✓ Appendix 2 includes all species that are not necessarily now threatened with extinction but may become so unless trade in specimens of such species is subject to strict regulation in order to balance their demand with their supply.

- ✓ Appendix 3 includes all species, which any contracting Party identifies as being subject to regulation within its jurisdiction for the purpose of restricting and controlling its exploitation.

    - o Article 3: Regulation of trade in specimens of species included in Appendix 1.
    - o Article 4: Regulation of trade in specimens of species included in Appendix 2.
    - o Article 5: Regulation of trade in specimens of species included in Appendix 3.
    - o Article 6: Granting of Permits and Certificates with CITES emblem, the name and stamp of the management Authority granting it and a control number assigned by the management Authority.
- ✓ The CITES like all the other selected international conventions contains some of the critical elements of the crucial aspects of the sustainable use and conservation of NTFPs, and was rated highly in Table 2.5.

2.5.2 National Policies

1. The National Forest Policy of 2002

Background

The National Forest Policy (NFP) has been written in the context of being one of several other policies concerned with the sound management of the environment that came out of the National Development Strategy (NDS). There are also international concerns that have to be resolved in the context and recognition of regional and international protocols and agreements. Swaziland is signatory to a number of United Nations Conventions on the environment and therefore has obligations to the international community, which need to be fulfilled (GOS, 2002a).

The NFP has divided the forestry sector into four main sub-sectors:

- ✓ Industrial Forestry - commercial plantations operated and managed by private companies. Most of the foreign exchange derived from forestry in Swaziland comes from this sector.

- ✓ Community Forestry - communal groups/individuals managing local forests or woodlots for timber, fuel wood, medicinal plants, food, dung and other cultural purposes.
- ✓ Urban Forestry - equivalence of community forestry in urban areas including parks, gardens and green belts for aesthetic value (amenity) and recreation.
- ✓ Natural Forests and Woodlands - remaining indigenous woody vegetation areas that are being rapidly degraded today due to unsustainable exploitation by adjacent communities for different purposes, including commercial fuel wood extraction and medicinal plants.

The vision of the NFP is "To achieve efficient, profitable and sustainable management and utilization of forest resources for the benefit of the entire society, and to increase the role of forestry in environmental protection, conservation of plant and animal genetic resources and rehabilitation of degraded lands"

1 Principles of the National Forest Policy relevant to NTFPs:

The following 10 Principles of the NFP are highly essential to the sustainable management of NTFPs at the local and national levels (GOS, 2002a):

1. Forests should be treated as a national asset;
2. Access to forest resources must be secured for the basic needs and requirements of the people;
3. Land and tree tenure should be guaranteed by the National Constitution of Swaziland;
4. Forest resources must be managed on a sustainable basis for optimum economic production based on stakeholder responsibilities;
5. Soil and water conservation capacity of forest land should be recognized, especially their retaining and recycling potential;
6. Forest and woodland reserves must be conserved and their biodiversity sustained by monitoring ecosystems and habitat diversity and stability;
7. Recognise the link between forest biodiversity and Swazi cultural and spiritual needs and rights;
8. Community participation, accountability and transparency have to be secured in the administration and management of forests and trees;
9. Equitable sharing and distribution of benefits from forest resources has to be recognized, including investment and employment opportunities; and

10. Gender equity should be applied in the management and utilization of forest resources.

Major Issues and Policies on natural forests and woodlands relevant to NTFPs

The main policies for natural forests and woodlands within the NFP are more directly inclined towards meeting the prevailing challenges of unsustainable use of timber and NTFPs at the local and national levels.

Concerns with regard to the current status of forest and woodland resources revolve around management issues. Population growth has put immense pressure on indigenous forests and as a result the use of forests by local communities is no longer sustainable. Forest products, such as forest medicines, are further depleted by uncontrolled commercial activities through sales and export to neighbouring countries. It is therefore necessary to address the underlying causes of deforestation and forest degradation and to formulate concepts and strategies to protect and conserve forest goods and services.

The vital issues and policy statements relevant to NTFPs are listed by GOS (2002a):

Issue: The natural forests and woodlands of Swaziland are not managed in a sustainable way.
Policy: Sustainable forest management systems must be fully developed and introduced to communities and all stakeholders, based on agreed national criteria and indicators.

Issue: Although most of the underlying causes of deforestation are recognized, there is lack of application of suitable measures to address the issues.
Policy: Remedial measures shall be developed and promoted to mitigate the underlying causes of forest degradation, which requires further identification and study, including analysis of the impact on the status of the forest resources.

Issue: There is an overall lack of control of fire in natural forests, woodlands and rangelands
Policy: Sustainable fire management practices for different land uses in Swaziland must be developed, implemented and promoted based on national and external research information, including prevention and fighting unwanted fires.

Issue: The general lack of awareness of the actual value of natural resources is one of the major causes of inadequate management and resulting degradation of forest and woodland resources.

Policy: Natural Resource Accounting (NRA) in forestry and promotion of proper valuation of forest resources will be further developed and applied in order to establish the true value of forests.

Issue: Opportunities to improve rural community livelihood by commercial and sustainable exploitation of forest resources are not sufficiently explored or made available.
Policy: Traditional leaders and community members should explore the options for improving commercial and sustainable exploitation of the commercial forest resources in order to improve their livelihoods.

Issue: Current trade in natural forest products is uncontrolled and not sufficiently benefiting communities.
Policy: Communities must retain the control over their forest resources and take measures to remain the principal recipients of the revenue and benefits obtained from forest products.

Issue: Communities are not making efficient and economic use of forest products by setting up small processing industries.
Policy: The development of small sustainable industries specializing in the processing of natural forest and woodland products shall be encouraged and supported.

Issue: At the present moment there is little community involvement in the management of conserved and protected land.
Policy: Community involvement in the establishment and management of protected areas for eco-tourism development or other purposes shall be encouraged and promoted.

Issue: The value of NTFPs is not fully recognized and established in the national accounts of Swaziland.
Policy: The true value and importance of NTFPs to the national economy must be established and recognized in national planning and accounting.

Issue: The present species utilization database of non-timber forest products is incomplete.
Policy: A comprehensive species utilization database of non-timber forest products needs to be created, in conjunction with research into the wider occurrence and potential of NTFPs in Swaziland.

Issue: The uncontrolled and unsustainable extraction of medicinal plants currently taking place in forests and woodlands has resulted in depletion or critical levels of certain species.

Policy: Medicinal plants must be protected by effective measures, to ensure that extraction and use will be sustainable and primarily aimed at satisfying local needs.

Issue: Currently there is an uncontrolled and over-exploitation and commercialisation of indigenous plant and tree species for the woodcraft market.
Policy: An inventory of indigenous species used for woodcraft should be compiled, and a re-planting programme of identified natural plant and tree species should be developed.

Issue: There is general shortage of fuelwood, although estimates of fuelwood consumption are not consistent and vary widely.
Policy: Measures must be taken to ensure sustainable supply of fuelwood to meet the needs of communities, based on a reliable and quantified estimate of fuelwood consumption and annual wood volume increment.

Issue: There is an increasing depletion of certain tree and plant species that are indispensable in the Swazi culture and tradition.
Policy: Sustainable utilization and rehabilitation practices must be introduced and followed for all the important cultural plants to maintain the Swazi tradition.

Issue: Forest degradation and poor management of natural forests and woodlands are no longer appealing to tourists, and thus hinders eco-tourism
Policy: A co-ordinated approach must be established to promote sustainable management of natural forests and woodlands for enhanced tourism and eco-tourism development.

Issue: Available information and public awareness of existing threats to biodiversity are insufficient, and current programmes to address the threats are insufficient.
Policy: The knowledge base of threats to biodiversity must be expanded and public awareness has to be raised about these threats. Programmes to eliminate threats to biodiversity must be pursued and prioritised.

Despite all the above issues and policy statements the National Forest Policy still fails to adequately address some of the 19 critical elements of sustainable use and management of NTFPs given under section 2.2.4.

2. The National Environmental Policy of 2002

The environment and natural resources of Swaziland are the foundation for economic and social development, and as a result yield important economic, social, cultural, emotional, spiritual and aesthetic values to the society. The basis of life on earth is entirely dependend on natural ecosystems and processes and it is imperative to put effort in maintaining these processes. Protecting diverse and fragile habitats and species are of fundamental importance at the local, national and international levels (GOS, 1999).

The National Environmental Policy (NEP) builds on the analysis and recommendations contained in the Swaziland Environmental Action Plan. It represents the next step in promoting sound and responsible environmental management across all areas of decision-making. It is important to recognize that although the NEP is presented as a distinct national policy, aspects of it must be integrated into other national programmes of action because all these programmes involve the use of natural resources and indirectly or directly affect the natural environment. Consequently, the NEP is expected to play a key role in integrating a range of policies and programmes into a comprehensive national policy framework geared towards equity-led growth and sustainable development. The NEP also embraces the regional and global environmental responsibilities that Swaziland has undertaken as party to various multilateral environmental agreements.

The core principles of the NEP relevant to the sustainable use and management of NTFPs are:

i. The natural environment of Swaziland is the heritage of all its peoples who individually and collectively bear the responsibility of safeguarding it for present and future generations;
ii. All our interactions with the environment should be characterized by *buntfu* and use of the environment should be managed on the basis of sustainability for the benefit of all Swaziland's inhabitants - both present and future;
iii. Every inhabitant of Swaziland is entitled to live in an environment that is conducive to health and well-being and to have access to the natural environment on an equitable and sustainable basis and to means of enforcing these rights;
iv. Environmental protection and social and economic development are interdependent and indivisible. Integrating environmental protection into the

process of social and economic development is essential to achieve equity-led growth and sustainable development;

v. Public awareness and public participation in decision-making concerning their environment is essential for effective, long-term environmental protection and equitable utilization and management of natural resources. The public will be given appropriate access to information concerning the environment that is held by public authorities. Information on the environment will be made widely available and education on environmental issues will be promoted;

vi. Communities and civic and private organizations will be encouraged and effectively empowered to take responsibility, in partnership with Government, for resolving environmental problems which they may create for managing the natural resources on which they depend, and for maintaining the quality of the environment in which they live.

The NEP has been rated as a good national policy with regard to the sustainable management of the natural environment (including forests and related ecosystems) for the conservation and sustainable use of NTFPs. The NEP has managed to address most of the crucial and critical aspects of NTFPs use and management as indicated in Table 2.5.

3. The National Biodiversity Strategy and Action Plan

The NBSAP was initiated by the United Nations Convention on Biodiversity (CBD), which Swaziland ratified in 1994. It also forms an integral part of the Swaziland Environmental Action Plan (SEAP). The NBSAP recognizes the broad spectrum of biodiversity in Swaziland. Since forestry is of significant importance in the biosphere, reference to forestry is common in this document (GOS, 2001a).

Priority actions identified in the NBSAP that are of relevance to the NTFPs include:

i. Enhancing the capacity and strength of the National Herbarium and Gene Bank and the establishment of the National Royal Botanical Gardens;

ii. Development of a Biodiversity Act for the protection and management of biodiversity in Swaziland, which would repeal the existing legislation such as the Flora Protection Act and other related acts;

iii. Development of the tree atlas of Swaziland;

iv. Identification and assessment of threats to biodiversity;

v. Formulation of the National Red data List of Threatened plants and animal species;
vi. Establishment of the true value of biodiversity and assess the commercialization potential of biodiversity with special reference to the marketing potential and recognition of the value of local indigenous technical knowledge regarding biodiversity issues;
vii. Undertaking of research on economically viable species, propagate and domesticate them and establish sustainable harvesting methods;
viii. Raise public awareness on biodiversity issues and clearly define relations between biodiversity and development;
ix. Promote small and medium business enterprises and companies for the harvesting, processing, packaging and trade of indigenous products such as foods , drinks and traditional medicinal plants;
x. Compel the System of National Accounts (SNA) to reflect the value of biodiversity with respect to direct and indirect use benefits and intermediate use services of forests and related ecosystems.

To consolidate the above issues the Biodiversity Programme Implementation Committee adopted some principles to guide the implementation of the NBSAP. The following basic principles are the backbone of the sustainable management of NTFPs (GOS, 2001a):

- ✓ The components of the biodiversity of Swaziland should continue to be identified, monitored and researched for the purposes of conservation, education, sustainable use, commercial use and leisure.
- ✓ The close link between the traditional Swazi way of life and biodiversity needs to be recognized and promoted in line with conservation principles.
- ✓ Participation and involvement at all levels is necessary for the conservation of biodiversity in Swaziland.
- ✓ Benefits derived from technological advances based on the use of indigenous technical knowledge and genetic resources should be shared equitably.
- ✓ Biodiversity is best-conserved in-situ (both within and outside protected areas), but where necessary ex-situ methods should be developed to support in-situ efforts.
- ✓ Threats to biodiversity should be addressed through an appropriate multi-disciplinary forum.
- ✓ Access to genetic resources rests with the State.

The above features of the NBSAP has made it to be the best national policy with regard to the development of NTFPs ahead of the National Forest Policy, as seen in the score sheet in Table 2.5. The NBSAP also developed 12 categories of forest goods and services (11 of which are NTFPs) to illustrate the socio-cultural relationship between Swazis and biodiversity (GOS, 2001a).

4. National Level Criteria and Indicators for Sustainable Forest Management

The development of criteria and indicators for sustainable forest management is part of the international initiatives to promote sustainable forest management (DANCED, 2001). The International Forestry Principles in Chapter 11 of Agenda 21 and the Convention on Biological Diversity recognize the importance of internationally agreed criteria and indicators, which demonstrate and characterize the management, conservation and sustainable development of all forest types. Criteria and indicators are instruments designed to assess trends and changes in the condition of forests in their ecological, economic, social, political and environmental context (UNEP and FAO, 1998, 1999; FAO, 2000). Regular measurements and monitoring of indicators provide forest managers, decision-makers and other interested parties with information on the trends in the forests with regard to sustainability (DANCED, 2001).

Swaziland has managed to develop 7 Criteria and 54 Indicators where minor additions and modifications were incorporated into the SADC Initiative on Criteria and Indicators for Sustainable Forest Management in the Framework of the Dry-Zone Africa. There are 6 new indicators added as the former had 47 Criteria and 48 Indicators. The formulation of the national level criteria and indicators was done in a stakeholders meeting with the assistance of an international consultant in Criteria and Indicators. In the same meetings it was agreed that in order to implement these set of Criteria and Indicators, parties responsible for indicator monitoring should be identified accordingly. Consequently, Stakeholders were identified from government, the private sector, NGOs and communities for indicator monitoring during the implementation of the national criteria and indicators for sustainable forest management (DANCED, 2001).

Testing of the set of National Level Criteria and Indicators will be done by the responsible agencies through collection and processing of information related to each indicator under their jurisdiction. The test is expected to reveal the quality of baseline data presently available, the availability of the baseline data and the human, technical and financial capacity of the responsible agency to carry out the monitoring under its charge.

Swaziland is in the process of preparing separate Forest Management Unit Criteria and Indicators for (i) Plantation management and (ii) Indigenous forest management. These criteria and indicators should be within the framework of the National Level Criteria and Indicators for sustainable forest management as well as relevant policies and legislation and in conformity with commitments to which Swaziland is a party. The summary of National Level Criteria and Indicators is presented in boxes 1 to 7 in Appendix 3.

2.5.3 National legislation

1. The Forest Preservation Act of 1910

This Act restricts the clearing and cutting of trees on SNL. Permission is required for cutting, selling and purchasing timber. However, collection of fuel wood and cutting of underwood and bushes on SNL is allowed. The Act allows, without prohibitions, the utilization of NTFPs for subsistence and commercial use.

An analysis of this Act clearly shows that it is outdated that can lead to the destruction of forests and trees under certain conditions without due consideration of its ecological impacts. Nevertheless a new Forest Bill is in preparation, which will repeal this act and emphasize sustainable forest biodiversity management in all areas, be it SNL or Title Deed Land (TDL).

2. The Game Act of 1953 (Amended in 1991 and 1993)

This Act establishes game reserves and deals with hunting and trade in wild animals including birds. It regulates the utilization of game and birds. However it is not yet established how it influences the harvest of bushmeat. This is a vital instrument for the ultimate protection of game in Swaziland, both within and beyond protected areas. It allows hunting of certain game with a permit, and clearly defines acceptable hunting methods and stipulates hunting seasons. This Act regulates the sale of game meat and protects bird eggs and young animals.

The Minister of Natural Resources and Energy is responsible for authorizing the declaration of sanctions for the protection of game species and birds. However, the relationship between this declaration of sanctions and the proclamation of reserves by the SNTC Act is not clear.

The amendment also redefines the powers of rangers and allows them to carry firearms within Swaziland. The three schedules of the act list many threatened species but do not seem to be based on any Red Data Lists. A number of large animal groups, especially reptiles and

amphibians, and all invertebrates, are omitted from these schedules and this requires urgent attention.

The Non-bailable Offences Order of 1993 makes poaching a non-bailable offence. Together with the 1991 amendments to the Game Act, this order was a milestone in the country's conservation efforts and has markedly reduced poaching of large game (especially the white rhinoceros) in the country.

3. The National Trust Commission Act of 1972 (Amended 1973)

This Act establishes the Swaziland National Trust Commission (SNTC) and is the principal law governing habitat protection and forms a basis for declaration of National Parks and Nature Reserves. This law puts areas off-limit for NTFPs harvesting, i.e. national parks and nature reserves. In addition, this Act provides for the operation of cultural institutions, such as museums, galleries, herbaria, botanic gardens and plant nurseries. It provides for the exclusion of non-indigenous animals and plants and the protection of all biodiversity within the boundaries of proclaimed reserves and national monuments. However, the protection of these habitats and related ecosystems is not sufficiently addressed and ecosystem representation is not specifically mentioned. This needs to be covered urgently and within the mandate of the SNTC.

4. The Plant Control Act of 1981

The Act prohibits the exportation of indigenous plants without written permission. It makes it illegal: to remove any indigenous plant for gain without written permission from the SNTC; to export indigenous plants without a written permission from the SNTC; and to collect and trade wild edible mushrooms without a written permit. This law sets out to control and regulate movement and cultivation of plants. It also deals with the control of the plant pests and diseases trafficking in and out of the country. It regulates the mushroom industry, noxious weeds, honeybees and alien animals.

The definition of a noxious weed is not clear though and as such, the schedule of noxious weeds is obsolete and needs urgent revision. This act may be amended to include alien invasive animals and be called the "Plant and Animal Control Act". Another concern is the fact that Customs and Boarder officials and inspectors have to be trained in basic identification of the organisms listed in the schedules of this act. The Plant Control Act of

1981 has repealed The Noxious Weeds Act of 1929 and The Wild Mushroom Control Order of 1973.

There is very little relevance of national legislation to NTFPs, and this is shown by the low grades the legislation were given in Table 2.5. More work on review and updating of outdated fragmented pieces of legislation had to be done, particularly regarding sustainable use and conservation of NTFPs in Swaziland.

2.6 DISCUSSION

The above results on the review and analyses of national and international policies and legislation show that there are many issues and elements of NTFPs in most of the programmes, confirming the environmental and socio-economic importance of NTFPs as mentioned in Hess *et al*., (1990), Balick and Mendelson (1992), Falconer (1992), Appasamy (1993), Chopra (1993), Godoy and Bawa (1993), Godoy *et al,* (1993), McKenney and Sarker (1994), FAO (1995, 2001) Lasschuit (1995), Clarke *et al*. (1996), Crafter *et al.* (1997), Mander (1998), Robles-Diaz-De-Leonand Kangas (1999), Yembi (1999), DANCED (2000b), Gram (2001), Hassan *et al*. (2002), Vedeld *et al*. (2004), Olsen (2005), Janse and Ottisch (2005), Te Velde *et al* . (2005), Trauernicht and Ticktin (2005), Shone and Harris (2005) and Shackleton and Shackleton (2005). The National Biodiversity Strategy and Action Plan and the National Criteria and Indicators for Sustainable Forest Management complement the National Forest Policy very well. This is in consideration of their ranking, in Table 2.6, according to key issues related to NTFPs development.

The analysis indicates that the CBD is the most reliable and comprehensive legislation that addresses NTFPs conservation in the context of ecological, environmental, social, cultural, and economical issues. This is in agreement with the views of the Secretariat of the Convention on Biodiversity, which states that sustainable management of NTFPs sits at the confluence of more articles of the CBD than probably any other component of natural resource use. A feature of sustainable management of NTFPs is the high diversity of species used (Articles 5, 6, and & 7), the local and indigenous knowledge linked to those uses (Articles 15, 8j) and the varying tenure arrangements and economic incentives for conservation (Article 11). More over, NTFPs trade networks are often complex, with serious impacts on species population dynamics (Articles 3, 5 and 11), requiring innovative assessment, monitoring and conservation (Articles 7, 8, 9, 14, 16 and 18).

Over and above that, CBD and CITES also play a vital role towards local, national, regional and international efforts in NTFPs development, as evidently seen in the analysis (Table 2.5). Other selected policies and legislation also appear to contribute to the development of NTFPs but to a lesser extent, most probably because they are not forest-biodiversity oriented. Other relevant international policies and legislation (i.e. Millenium Development Goals, The World Bank Forest Strategy/Policy and Forest Certification, The Environmental Initiative of NEPAD, SADC Policy and Strategy for Environment and Sustainable Development, SADC Forestry Protocol and Agenda 21) contain crucial policy issues and elements on environmental resources that have a great potential towards poverty reduction and environmental conservation. These are clearly highlighted in section 2.5.4 above. These international agreements are a cornerstone to regional and global poverty reduction, sustainable development and maintenance of environmental services.

It is also evident that there are remarkable overlaps between these various policies and action plans showing that there is lack of coordination in the formulation of these policies. The new NFP has however managed to consider and integrate all the various nominal and functional policies and initiatives on forestry and environmental management issues in its formulation. This is similar to the programmes on sustainable management of tropical forests in Central Africa (FAO, 2003b) and those on the value, use and management in Africa and Latin America (Crafter *et al*., 1997). The NFP is presently the only nominal forest policy in Swaziland successfully addressing all the existing forestry sectors except for Trees Outside Forests (TOFs) (which is a major exclusion considering the FAO Forest Resource Assessment Guidelines of year 2000). The omission of TOF could easily result in the negligence of the environmental role of these trees as well as the NTFPs harvested. The FAO definition of NTFPs (FAO, 2002) does include trees outside forests as producers of NTFPs.

Most of the existing national legislation, including The Game Act, The Plant Control Act, The Forest Preservation Act and The National Trust Commission Act has inherited shortfalls from their predecessors. The most significant gap in most of the existing laws is the lack of protection of NTFPs on SNL, which covers over 70% of the natural forest resources of the country and contains an incredible fraction of the NTFPs of the natural forests and woodlands. A clear sign of this error is that current nominal and functional legislation does not support sustainable utilization of NTFPs on the SNL (GOS, 1999).

The working relationship and collaboration between lead institutions that are responsible for the management and conservation of biodiversity (including NTFPs) in Swaziland is not reflected or clearly defined in any of these acts. For example, the SNTC is responsible for

three nature reserves (Malolotja, Mlawula and Mantenga) while Big Game Parks are also responsible for another three nature reserves (Hlane National Park, Mkhaya Nature Reserve and Mlilwane Wildlife Sanctuary). Both parties are reasonably supported by appropriate legislation but the failure of the law to define how they should collaborate in their conservation efforts has lead to mistrust and the one undermining the conservation efforts of the other. Merging the various acts that govern such institutions may alleviate this problem.

There is lack of linkage between the current legislation that protects certain species and the National Red Data Lists of Threatened Species. The Red Data List for plants provides a detailed all-encompassing list of threatened species of flora, based on clearly defined criteria (e.g. the IUCN Guidelines). Unfortunately, some of the threatened species are not listed on the schedules for protection in the Flora Protection Act. Consequently, such inconsistencies and lack of harmony between legislation could easily lead to policy failure.

The Game Act emphasizes protection of certain categories of faunal resources leaving out quite a number of others. An example could be the inclusion of birds and large mammals and the exclusion or omission of indigenous reptiles (except two species), amphibians and invertebrates in Swaziland. In The Flora Protection Act, in the case of floral resources under lower plants, only mushrooms are protected in the existing laws, yet all living organisms have a role to play in life, especially in the production of forest products some symbiotic interactions between an array of living organisms have to occur before certain products are formed. Ecologists argue that biological diversity plays a crucial role in maintaining the resilience of ecosystems to environmental shocks. Consequently, the constant decline in biodiversity negatively affects the performance of the ecosystems regarding plant productivity, nutrient retention, and water retention, decomposition of materials, gaseous composition and climatic changes (Bhattarai and Hammig 1998).

A notable gap is in The Protection of the Fresh Water Fish Act. The act proclaims “open seasons” for the harvesting of certain species regardless of the populations available for sustainable harvesting. As a result fish populations may still decline to non-viable levels even if open seasons are adhered to.

Alien invasive plants and animals are currently perceived as the major threats to natural forests and woodlands in Swaziland, but legislation controlling their introduction and spread is totally inadequate and needs urgent attention. However, a framework for a National Strategy for Alien Invasive Plants (AIP) is in the process of being developed although none exists for alien animals as yet.

Aquatic habitats and ecosystems like wetlands are of great ecological importance, and are normally fragile and easily degraded. This is partly due to forest degradation, uncontrolled deforestation, climate change and many factors that prevail in Swaziland and globally. Irrespective of this, there is still no particular law that protects wetlands and related ecosystems in the environmental laws of Swaziland (GOS, 1999).

The lack of appropriate conservation categories in the SNTC Act (which is specific to national parks and nature reserves) has lead to failure to proclaim certain categories of Protection Worthy Areas (PWA's). The SNTC Act needs to be reviewed to be able to permit a broader spectrum of categories of conservation areas, without unnecessary restrictions. The NTFPs are spread all over proclaimed and unproclaimed conservation areas and rural dwellers have unlimited access, especially to unproclaimed areas, resulting in uncontrolled utilization of the products leading to extinction of certain species.

Current and existing legislation hardly supports the *ex-situ* conservation of zoological NTFPs. This is shown by the mention of botanical gardens and omission of zoological gardens and gene banks. The National Royal Botanical Garden of Swaziland has not yet been established but plans are underway for its establishment near Manzini in the Middleveld of the country.

Consistent overlaps within legislation have lead to duplication of responsibility. The Flora Protection Act, The Game Act, the National Trust Commssion Act and The Natural Resources Act all permit the proclamation of reserves. These Acts are housed in four separate institutions that lack integration and coordination of their conservation efforts leading to a species-based and not holistic approach to biodiversity conservation in the country. It is expected that the formulation, development and implementation of the proposed Biodiversity Act will harmonize all the legislation discussed above for the betterment of sustainable biodiversity and overall environmental management and conservation.

All the 7 criteria and 54 indicators described above, if effectively implemented, would play a pivotal role in the sustainable management of natural forests and woodlands in Swaziland. This means that natural forests and woodlands would be in a better position to continue producing and supplying a broad spectrum of timber and NTFPs as well as providing the necessary environmental protection functions. Therefore, the future of edible and medicinal NTFPs would be definitely guaranteed. Over and above that, the most highly commendable criteria and indicators that would have a direct impact in the sustainability of edible and medicinal NTFPs are criterion 4, indicator 4.5, and criterion 6, indicator 6.2.

2.7 CONCLUSIONS AND RECOMMENDATIONS

It is evident from the results and discussion that none of the selected policies and legislation fully and adequately addresses all the key 21 issues highlighted under section 2.2.4. The UNCED Agenda 21, CBD and CITES are the best international principles that provide an excellent coverage for development and conservation of NTFPs. The current national policies also address some issues of NTFPs. However, due to the complex nature of NTFPs and their significant economic, environmental, social and cultural contribution, a separate comprehensive national NTFPs policy should be developed as a matter of urgency to save the diminishing pool of NTFPs from the natural forests and woodlands. The "National NTFPs Policy" should be formulated and developed in compliance with issues 1 to 21 outlined in section 2.2.4. This will make it comprehensive, contemporary and implementable.

The existing policies and legislation do not put any emphasis on secure access and benefits on NTFPs for local communities adjacent to natural forests and woodlands. It is recommended that Government and other concerned agencies and organizations should develop and implement policies and legislation to provide secure access and benefits to people whose livelihood are dependent on or supplemented by NTFPs. Furthermore, government with the assistance of concerned NGO's and other organizations and agencies should make sure that stakeholders, including collectors and traders, are provided with incentives to sustainably manage NTFPs resources. Most of the existing national legislation are old-fashioned and still over-emphasize preservation rather than sustainable use. These need to transform from preservation into sustainable use and decentralized forest management as recommended by FAO (1995, 2003b), Crafter *et al*., (1997), Mogaka *et al*., (2001), Barrow *et al*., (2002).

Most of the selected existing national policies and legislation do not incorporate schedules of plant and animal species in the National Red Data List of Threatened Species. It is strongly recommended the all these policies show RDL status of species. Monitoring and evaluation tools to update the RDL schedules should be established as well, to keep up with the rapid changes in biodiversity at local and national levels.

Economic incentives and biodiversity conservation is one of the themes of the CBD and forms a major part of the focused agendas of recent meetings of the CBD, as well as international forums concerned with biodiversity (UNEP, 1992a). NTFPs are a major component of biodiversity and new policies and legislation should promote economic incentives and discourage economic disincentives for the sustainable management and use of

NTFPs, as specified in the CBD. This will aid in attracting local communities into NTFPs conservation initiatives and projects. Most governments aim to correct policy failures in NTFPs conservation programmes by increasing subsidy in farming which results in an even bigger failure when more land is cleared for agriculture with an increased loss of ecological resources (Bhattarai and Hammig, 1998), but this can be controlled.

Participatory implementation of the National Criteria and Indicators for Sustainable Forest Management, considering their superiority in the coverage of the multidimensions of NTFPs, would be a great achievement. The conservation and sustainable use of NTFPs is in agreement with the FAO/Netherlands Partnership Programme on Conservation and sustainable management of tropical moist forest ecosystems in Central Africa (FAO, 2003b). Environmental policy analysis and instruments for NTFPs conservation should be developed. These would consistently monitor: the causes of NTFPs decline; conservation versus economic development; NTFPs valuation issues; NTFPs benefits to individuals, communities and national and international societies; NTFPs market failure situations; policy and government failures; and NTFPs and economic policy options.

The existing national policies (especially the National Forest Policy, National Biodiversity Strategy and Action Plan and National Criteria and Indicators for Sustainable Forest Management) contain remarkable policy statements and issues towards the development and sustainable use of NTFPs, as well as trade chains and value adding processes to enhance local communities. However, they do not state who exactly should assist communities in establishing these projects. The role of NTFPs in sustainable forest management is highlighted in the national level criteria and indicators for sustainable forest management. It is recommended that these national policies be implemented with the engagement of the full range of stakeholders, including NTFPs collectors and traders.

National legislation is outdated and old-fashioned and need to be reviewed and updated according to the prescriptions and requirements of the regional protocols and international principles. This will enable them to be implementable and enforceable.

The immediate adoption and implementation of the 11 policy recommendations on the sustainable management of non-timber forest resources by the Secretariat of the CBD is highly recommended. It is worthwhile to note that while some recommendations were directly inherited from certain articles of the CBD some are general recommendations. Briefly these recommendations may be summarized as follows:

1. Achievement of a balance between conservation and sustainable use of NTFPs (CBD Article 8a);
2. Land-use and infrastructure planning need to take into account protected areas, adjacent conservancies, co-management areas and requirements to maintain valuable populations of valued but vulnerable species;
3. Ecosystem level and harvested population management planning must take place through a consultation process that involve scientific and indigenous knowledge;
4. Development and implementation of effective conservation and resource management plans may need legislative reform before managed use of NTFPs provides incentives for conservation as a form of land-use (CBD Article 8k);
5. Legislative change, technical support and economic incentive for ecological restoration of wildlife corridors and for the control of invasive plant and animal species may be necessary for maintenance or re-establishment of viable populations of indigenous plant and animal populations;
6. Training: recognize and strengthen the role of local people in inventory, research, monitoring and impact assessment processes, and management (CBD Article 12);
7. Appropriate and economically viable monitoring systems should be developed and established at the landscape and local levels (CBD Article 7);
8. Integration of NTFPs uses into micro and macro-level forest management and use planning programmes;
9. Conservation through cultivation or farming of wildlife, which is economically viable and at a reasonably large scale to relieve the pressure from wild stock;
10. Raise awareness of importer, exporter, manufacturers and retail buyers;
11. Ex-situ conservation (CBD Article 9).

The forest sector presents unique opportunities and unique challenges to national and international development in the new millennium. It plays a key role in poverty alleviation, sustainable development and the maintenance of environmental goods and services. It is therefore recommended that all new and revised national and international forest policies, strategies and laws (as highlighted in this chapter) are effectively implemented in order to realize the Millenium Development Goals set by the United Nations, since poverty reduction and environmental conservation are the nucleus of the efforts to achieve the MDGs.

CHAPTER 3: THE STATUS OF THE NTFPs SUB-SECTOR OF SWAZILAND

3. 1 INTRODUCTION

3.1.1 Background

Research has shown that in Swaziland NTFPs are in common use (Dlamini, 1998, 2000; DANCED 2000b; GOS, 2002a; Hassan *et al.*, 2002) and that NTFPs utilization occurs alongside small-scale agriculture and extensive communal grazing as a secondary land use. The concern about the NTFP sector is important as they contribute to increased rural household incomes, can contribute to cash flow into rural areas and from abroad into the country, can lead to improved management of indigenous forest resources, can contribute to maintaining traditional and cultural knowledge and practices, and can contribute to improved rural food security and nutritional status (Falconer, 1992; Clarke *et al.,* 1996; Robles-Diaz-De-Leon and Kangas, 1999; Chapeskie, 1999; Shackleton *et al*., 2000, 2002; Dovie *et al.,* 2001; DANCED, 2000b; Hassan, 2001; Hassan *et al.,* 2002; FAO, 2003a; Clarke and Grundy, 2004; Lawes *et al*., 2004; Shackleton and Shackleton, 2004, 2005; Janse and Ottisch, 2005). This is why NTFPs form a basis for the sustainable management and utilization of indigenous resources (FAO, 2001; Grundy and Mitchell, 2004; Lawes *et al*., 2004).

The list of plant species supplying the main forest products harvested in the wild in Swaziland is well documented but quantitative statistical data on their economics and management is still lacking (Dlamini, 1981; Ogle, 1982; Braun and Dlamini, 1994; Mander, 1998; Brown, 1999; Dlamini, 1999, 2000; DANCED, 2000b). There are about 3400 species in 771 genera in 135 families, and 206 species are declared protected (GOS, 2001b).

However, accurate basic information on most aspects of the use and conservation of NTFPs is missing, such as (i) information on species utilized, (ii) information on amounts and values of species utilized, (iii) information on species utilization patterns, including indigenous management systems and intra household tasks and responsibilities, (iv) information on supply and demand levels, including end uses and end users, and sustainable harvesting rates, and (v) identification of factors determining utilization patterns (Dlamini, 1999; DANCED, 2000b; Hassan *et al.*, 2002).

The above factors are a basis for sustainable forest management without which it becomes difficult to maintain a good balance between NTFPs demand and supply (FAO, 1995, 2003b;

Crafter *et al*., 1997; Hassan *et al*., 2002; Lawes *et al*., 2004; Janse and Ottisch, 2005; Olsen, 2005).

Most importantly, the classification and economic valuation of NTFPs remain a great challenge at the local, national, regional and international levels. There are efforts being made to develop and implement universal and standard methodologies for the classification, assessment and valuation through an international expert consultation programme and individual researchers and scholars (FAO, 2001).

3.2. SPECIFIC OBJECTIVE

To review the current status of the NTFP sub-sector: to highlight past NTFPs valuation studies in Swaziland; to compile an up-to-date list of major use categories of NTFPs, and to rank NTFPs species in their order of importance.

3.2.1 Associated Research Questions

- ✓ Are there any past national studies on the flow value and inventory value of natural forests and woodlands and what methods were used?
- ✓ What are the existing categories of NTFPs goods and services?
- ✓ What are the most highly rated NTFPs species in terms of multiple-use properties (specifically goods)?

3.2.2 Hypothesis to be tested

Hypothesis: There is insufficient research on the status, socio-economic use and value of NTFPs in Swaziland.

3.3 METHODS

The method used to compile the major use categories of NTFPs and further rank the NTFPs plant species in their order of importance was modified from Ogle (1982), Lasschuit (1994, 1995), FAO (1995), Crafter *et al.* (1997), DANCED (2000b), FAO (2001), Gram (2001) and Hassan *et al.* (2002).

3.3.1 Step One: Highlights of previous studies of NTFPs

A brief summary presentation of previous national studies on NTFPs was made. At least two recent studies on valuation of NTFPs were reviewed, mainly on the basis of the methods used and the results obtained. The first study was that of DANCED (2000b) which presented a review of the NTFP sub-sector of Swaziland, and the second study was that of Hassan *et al.* (2002) on natural resource accounts for the state and economic contribution of forests and woodland resources in Swaziland. The main purpose of this exercise was to show how far Swaziland has progessed in NTFPs assessment and valuation and emphasized the need for more research towards the development of NTFPs.

3.3.2 Step Two: Categories of NTFPs

Existing literature was reviewed to identify and establish the main use categories of NTFPs goods and services in Swaziland. Existing literature include past studies on the national flora, protection-worthy areas, forest resource assessments, NTFP sector, natural resource accounting, national red data list, the flora act, species utilization patterns and other relevant studies. Consequently, an up-to-date list of the use categories of NTFPs was compiled, by this study, to reflect the national spectrum or coverage of NTFPs. Subject matter specialists were interviewed to get some detail on the status of certain NTFPs.

3.3.3 Step Three: Highly rated multiple-use NTFPs

The main use categories developed in section 3.4.2 for NTFPs goods and services were used to select the direct use benefits (goods) for multiple-use analysis. The selected NTFPs were anlaysed in a matrix: the most highly preferred and commonly used species were matched with the different use categories, and scores were awarded according to the number of uses a species can be attached to. Species were ranked according to their order of importance. This was mainly to assess and establish the multiple uses of the natural forests and woodlands of rural Swaziland.

3.4 RESULTS

3.4.1 Overview of previous studies on NTFPs valuation in Swaziland

3.4.1.1 Review of the NTFP Sub-Sector in Swaziland

In chapter 3 of the review of the non-timber forestry sub-sector in Swaziland (DANCED, 2000b), the national economic value was calculated for four selected NTFPs groups (foods and drinks, household items, medicinal plants and fuelwood). Most of the assumptions made, for example regarding number of people involved or quantities consumed, were derived from investigations in the Lowveld of South Africa (Shackleton and Shackleton, 1997).

Given the uncertain nature of applying these findings to Swaziland, low and high estimates are used to derive minimum and maximum values for each product group. All quantitative information collected through face-to-face interviews supports the ranges chosen for the calculations for Swaziland. The study focussed only on estimating the economic value of annual consumption of the selected main NTFPs groups, and income accruing from wages paid to casual workers, during harvesting, processing, transport and sales activities connected to utilization. Including these wages would increase the value of NTFPs to the Swaziland economy. The annual economic values of selected NTFPs groups were summarised. A modified version of the original results, showing only the sum total for each selected group, is presented in Table 3.1.

Table 3.1: Overview of annual economic value of selected NTFPs groups

NTFPs group	Value*	Median value*	% Importance
Foods and drinks	0.4 -2.9	1.7	3.4
Household items	0.4 -2.9	1.7	3.4
Medicinal plants	12.76-51.52	32.1	65.1
Fuelwood	6.2-21.55	13.8	28.0
Total	19.8-79	49.38	100

Source: modified from (DANCED 2000b) ******(US$ millions)

The results indicate an average annual value of the selected NTFPs groups of between US$19.8 million and US$79 million with a median value of US$49.38 million. The most important group from an economic point of view is medicinal plants with an average annual value of US$32.1 million, followed by fuelwood with an estimated annual value of US$13.5 million. Foods and drinks, and household items, are similar in importance with each group contributing an average annual economic value of US$1.69 million. This means that the value of NTFPs, when services such as contribution of plants to combat soil erosion and maintain soil fertility are included, is probably many times the value of plant products consumed

(DANCED, 2000b; Hassan *et al.,* 2002). This study illustrates the importance of NTFPs when based on market prices. If calculations were based on replacement costs of the products and services (eg. replacing thatching grass with corrugated iron roof), it would result in very high values indicating that communities and government cannot afford replacement.

3.4.1.2 Natural Resource Accounts for the State and Economic Contribution of Forests and Woodland Resources in Swaziland

The analysis of asset values and flow benefits of natural forests and woodlands in Swaziland was based on factual information (Hassan *et al.,* 2002). Primary data on resource use and harvesting rates and products' prices were collected from sample surveys of communities relying on the natural resource base for various uses. Three surveys were conducted: a household survey, a market survey, and a survey of traditional healers. A multistage simple stratified random sampling approach was adopted for community user surveys. The second layer of stratification was based on the four ecological zones of Swaziland to capture variability in climatic and socio-economic conditions between and within the ecological zones across the country. Accordingly, sampling fractions were designed to represent 10 selected vegetation strata and the four ecological zones. Most importantly, only rural communities were included in the user surveys due to the low dependence of urban populations on direct harvesting from natural forests and woodlands (Hassan *et al*., 2002). This study identified seven major NTFPs groups, namely Fuelwood, Fodder, Thatch, Edibles, Medicines, Craftwood, and Weaving grass, and did an economic valuation of the groups. Table 3.2 highlights the value of the NTFPs groups and excludes the other forest products reported.

Table 3.2: Total value of NTFPs groups harvested for various purposes by ecological zone (US$ millions/year)

NTFPs group	Highveld	Middleveld	Lowveld	Lubombo	Total
Fuelwood	10.98	8.27	7.20	3.15	29.6
Thatch	0.36	0.46	0.47	0.03	1.33
Edibles	0.07	0.04	0.10	0.01	0.24
Medicines	0.01	0.09	0.03	-	0.10
Craftwood	0.01	0.04	-	-	0.06
Weaving grass	0.27	0.15	0.07	-	0.50
Fodder	0.30	0.33	0.20	0.06	0.99

Source: Modified from Hassan et al. (2002).

The contribution of natural forests and woodlands in flow benefits, including the highlighted NTFPs, was equivalent to 2.2% of the total GDP, 20% of agriculture's GDP and 439% of the contribution of forestry reported in the national accounts for 2000 (Hassan *et al*., 2002). It should be noted that this excludes indirect use benefits and intermediate services of the

natural forests and woodlands (i.e. watershed protection, nutrients supply, pollination services, carbon sequestration, biodiversity conservation and others).

3.4.2 Non-timber Forest Products Categories

Although this section of the study was aimed at highlighting the main user categories of NTFPs, it was worthwhile to present an overview of the user categories of both goods and services to capture the complete status of the entire NTFP sector in the country, and later concentrate on the goods aspect of the sector in the subsequent section.

The review of existing literature has resulted in the compilation of a list of the 18 major use categories of NTFPs in Swaziland (see Table 3.3), which was compiled with reference to Campbell (1987), Falconer (1992), FAO (1995, 2001), Clarke *et al*. (1996), Shackleton (1996, Shackleton, 2002; Shackleton and Shackleton, 1997, 2000, 2004, 2005, Allen *et al.* (1998), Crafter *et al*. (1997), Helles (1999), DANCED (2000b), UNEP (1992a), Alexander and Mclain (2001), Dovie *et al.* (2001), Hassan (2001), Hassan *et al.* (2002), Shackleton *et al*. (2000), , Clarke and Grundy (2004), Lawes *et al.* (2004), Janse and Ottisch (2005).

The list of NTFPs use categories (Table 3.3) is in line with international grouping of NTFPs and is open to improvement and further development.

Table 3.3: Use categories of NTFPs in Swaziland (goods and services)

Use Category	Comments
Direct Use	
1. Forest Foods and Drinks	Edible fruits, leaves, roots, buds, herbs, other edible portions that contribute to improving food security and nutritional status
2. Forest Medicines	Leaves, bark, fruits, roots, other
3. Thatching Material	Different grasses used as roofing material
4. Plant Tannin and Dyes	Plant dyes from bark and other parts, including vegetable tannin materials
5. Household Items and Fibre Products	Items made from indigenous forests found in households; include kitchen utensils, mats, sweepers, other
6. Handicrafts and Fibre products	Everyday utensils, some also used in traditional ceremonies. Weapons such as knob sticks. Traded items made for tourists
7. Animals and animal products	Ivory, trophies, bones, feathers, butterflies, live animals and birds and bushmeat, etc
8. Fuelwood and Charcoal	A major source of energy to both rural and urban households traded in large amounts throughout the country.
9. Other NTFPs	Spices, insect products, natural plant pigments, essential oils, incense wood, latex, plant gums, waxes etc.
Indirect Use	

10. Cultural Ceremonies and Rituals	Plants used in local and national ceremonies. Use of bird feathers in traditional gear, Plants and animals used as indicators, e.g. red chested cuckoo calling in the ploughing season.
11. Landscaping and Ornamentals	Shade, windbreaks, garden plants, hedges, aesthetics. Improves the scenery.
12. Fodder and Grazing	Trees, shrubs, grasses, and others that provide for livestock fodder
13. Floral Greenery	Ferns, wild flowers, herbs, other
Intermediate Use Services	
14. Tourism and Recreation	Forests and trees provide habitats for animals and plants that attract foreign visitors and generate income. Useful in Biodiversity conservation.
15. Soil Fertility and Soil Conservation	Plant parts such as roots, leaves, fruits, bark, other, that contribute to soil stabilization and maintaining soil fertility
16. Pollination Services	Various insects; bees, beetles and other that contribute to crop production; including birds and bats.
17. Hydrological Cycle and Water Conservation	Natural forests and woodlands play a crucial role in the water cycle and in water holding and circulation
18. Other Environmental Services	Services such as oxygen production, acid rain deposition, carbon sequestration,

3.4.3 Matrix of NTFPs plants species commonly used in Swaziland (Botanical NTFPs)

This section of the study selected the most preferred and commonly used and preferred plants, based on the findings of Compton (1976), Dlamini (1981, 1999), Ogle (1982), Mander (1998), Cassidy *et al.* (2000) and Braun *et al*. (2004). A matrix of the NTFPs plant species was developed based on 14 uses and provided a clear ranking of species in order of importance (Appendix 10). Unlike in the previous section, only direct use benefits (i.e. only goods) were selected and services were excluded. These NTFPs were:

1. Edible leaves
2. Edible fruits and berries
3. Other edible portions
4. Medicinal products
5. Wattle and tannin
6. Fuelwood
7. Building material
8. Floral products
9. Landscape
10. Crafts and household
11. Fodder and grazing

12. Tannin and dyes
13. Thatching plants
14. Cultural plants

At present there are at least 208 edible species, 39 species for household items, 338 species for medicinal use, 9 species for fuel wood, 53 species for handcrafts, 9 species for fodder and grazing, 52 species for cultural rituals, 13 species for tannin and dyes, 17 ornamental, 8 for thatching and the rest are still being studied (Compton, 1976; Dlamini, 1981).

The top species was *Sclerocarya birrea* which is attached to 6 categories of use, namely edible fruits and berries, medicinal, fuelwood, landscape, crafts and household and fodder and forage. Other top species include *Berchemia zeyheri*, *Bauhinia galpini*, *Dichrostachys cinerea* and *Syzygium cordatum*, which are associated with 4 use categories each. A short list of the top species is displayed in Table 3.4. The rest of the species fall within 1 to 3 use categories.

Table 3.4: The top 12 versatile plant species commonly used in Swaziland

Latin Name	No of uses	Siswati Name	Common name
Species with 6 uses			
Sclerocarya birrea	**6**	Umganu	Marula
Species with 4 Uses			
Bauhinia galpinii	**4**	Lusololo	Pride-of-the Kaap
Berchemia zeyheri	**4**	Tineyi	Red Ivory
Dichrostachys cinerea	**4**	Lusekwane	Sickle Bush
Euclea crispa	**4**	Indvodzemnyama, Umdlelanyamatane	Blue Guarri
Syzygium cordatum	**4**	Umncozi	Water Berry
Species with 3 Uses			
Acacia dealbata	**3**	Umtfolo	Silver Wattle
Acacia karroo	**3**	Umgamba	Sweet Thorn
Brachylaena discolor	**3**	Umphahla	Coast Silver Oak
Ficus sur	**3**	Umkhiwa/Umkhiwane	Cape Fig
Phoenix reclinata	**3**	Lisundvu	Wild Date Plum
Ziziphus mucronata	**3**	Umphafa	Buffalo Thorn

The rest of the categories of NTFPs not described above have not been well studied or investigated but Appendix 11 presents a list of common species under each of these categories.

3.5 DISCUSSION

The two NTFPs studies done in Swaziland show the socio-economic contribution of NTFPs to local and national economies, and the high economic values attached to these resources (Hassan et al., 2002; Mbuli, 2003). It is worth noting that the ecological and environmental role of NTFPs goods and services has not been studied at the local level, and indicates that the current values are for direct use benefits, and are a conservative estimate of the total value of NTFPs in Swaziland (DANCED, 2000b; Hassan *et al.*, 2002; Mbuli, 2003). In particular, the variation in the economic value of the various NTFPs shows that there is still a great deal of research needed to capture the total value of the NTFP sector in the country. In view of the fact that resource valuation is a critical element of resource policy decision (FAO, 1995; Crafter *et al*., 1997; Bhattarai and Hammig, 1998; FAO, 2001; Mogaka, *et al*., 2001; Barrow *et al*., 2002), it is imperative that government, NGO's, the private sector, other development agencies and communities work together in raising funds to embark on a series of NTFPs studies to capture the multidimensional value of NTFPs goods and services.

The results from the two studies gave very different total economic values. This could be a result of the use of different NTFPs classification, assessment and valuation methods due to the lack of a standard methodology. This argument is presented by Gram (2001) in a study on the assessment of methodological shortcomings in the economic valuation of special forest products. Different methods were studied in relation to local uses of timber and NTFPs, including plants, fish and animals. Both products for the market and for subsistence used were included. The results of the analysis show that methods frequently used by scholars are subject to serious uncertainity, as is the case with the Swaziland Case Studies.

The classification of NTFPs into major groups is a relatively new concept in the forestry sector in Swaziland. Dlamini (1999) and DANCED (2000b) attempted to compile a list of main groups of NTFPs but omitted certain important goods and services such as charcoal, pollination services, floral greenery, wild flowers and herbs, and other forest products such as dung, stones, sand, small construction wood, water and clay. The category of forest foods was not well defined as to which are the main components, such as edible herbs, wild edible mushrooms, wild edible fruits and berries and edible animals and animal products and as a result this study attempted to rectify this issue.

The results show that there are several truly multipurpose species of NTFPs, with the most versatile species being *Sclerocarya birrea* with six uses as reflected in the NTFPs matrix in Appendix 11. According to a market research in Southern Africa *Sclerocarya birrea* is more

popular amongst European consumers than apples, and fruit farmers are planting more of the latest *S. birrea* cultivars to try and keep up with the demand (Lawes *et al*., 2004). This information confirms that some of the indigenous plant species in the natural forests and woodlands are fit for both timber and NTFPs depending on the intended use at the time. They need to be targeted for studies around integrated and multiple use of the different products used by different users from the rural to urban areas. The ranking of NTFPs species is a crucial aspect in the formulation and development of tree domestication and commercialisation programmes.

The above provides an overview of basic information relevant to NTFPs in Swaziland. However, it is notable that there is no specific information on the inventory value and flow value of NTFPs in the four ecological zones of the country. This makes it very difficult to assess the impacts of harvesting NTFPs on the natural forests and woodlands. The GTZ and DANCED national forest inventories of 1990 and 1999, respectively, did not include NTFPs as a distinct component of the natural forests and woodlands and this warrants national inventories of NTFPs.

3.6 CONCLUSIONS AND RECOMMENDATIONS

NTFPs were undoubtedly a good source of direct benefits (commercial and subsistence) and indirect benefits (ecological processes, biological diversity, cultural, ritual/heritage) as highlighted in Crafter *et al*. (1997), DANCED (2000b), Dovie *et al.* (2001), Shackleton and Shackleton (2000, 2004, 2005), Shackleton *et al.* (2000, 2002), Hassan (2001), Hassan *et al*. (2002). UNCED (1992) recommended the integration of conservation and sustainable use of biodiversity (of which NTFPs are a component) into all national and international decision-making. Swaziland should implement this recommendation in order to enhance the development and conservation of the vast array of life-supporting NTFPs in the natural forests and woodlands as well as man-made forest plantations.

There is, currently, a profound lack of information to capture and realize the full range of benefits that accrue from the wide array of NTFPs to individuals, communities and the national well-being. Decision-makers, forest managers and resource users (communities) lack a clear understanding of the potential and actual economic, ecological, environmental, social, cultural and political value of the existing NTFPs in the country. It is therefore recommended that Government, NGOs and the private sector should work together to conduct research involving the resource users in order to generate, compile and disseminate information and

quantitative and qualitative statistical data on NTFPs resources, their socio-economic uses and ecological and environmental values.

In addition, government and other development agencies should support education and public awareness programmes for NTFPs conservation through management for sustainable use. The national forest policy and other sectoral policies should promote the development of more NTFPs, as currently only a few are being utilized and as a result the natural forests and woodlands are under utilized for NTFPs, yet communities are faced with poverty.

A standard local NTFPs classification system, resource assessment methods, and economic valuation methods should be formulated, developed and implemented for the ease of NTFPs development and sustainable use. These methodologies should be developed in accordance with regional and international guidelines. These should incoporate the following:

1. Proper community consultations conducted to capture the actual status of the NTFP sector in all the four ecological zones;
2. Participatory user surveys to assess the real quantities of NTFPs harvested and utilized;
3. Participatory resource surveys to assess the standing stock of species supplying the preferred NTFPs, and if demand exceeds supply, then alternative sources should be developed through agriculture/forestry production systems;
4. Prices gathered from collectors and the neighbouring markets and not from other countries, since they vary within and between villages in one country;
5. Sound economic valuation methods and procedures adopted and followed for both product flow and inventory/standing stock;
6. There should be minimal extrapolations of figures or results, but results have to be site specific and as accurate as possible. Results should reflect means of sampled households or plots indicating the specific villages or specific natural woodlands.

CHAPTER 4: COMMUNITY CONSULTATIONS ON RESOURCE USE AND MANAGEMENT

4.1 INTRODUCTION

Natural forests and woodlands are facing great loss of biodiversity due to uncontrolled, unsustainable forest products extraction. This shows that resource management and research programmes are not effective. This is mainly because ecological, economic and social planning and research are unco-ordinated and done in isolation from each other (Geldenhuys, 2002, 2003, 2004). Furthermore, it is clear that the current control mechanisms and policy and legislation are failing to prevent forest degradation, and one option to save this situation could be to embark on more comprehensive ecological research for a sound scientific understanding of natural forests and woodlands in order to be able to design successful sustainable forest management strategies (Geldenhuys, 2002).

New approaches to forest sustainability have developed strong partnerships between academia, government, the environmental community and the industry and this has proved to be the most successful remedy (Abubakr *et al.,* 1997; Crafter *et al.,* 1997; GOS, 2002b). Sustainable forestry is achievable when the needs of landowners and managers are balanced with the ecological capacity of the forest ecosystem. In view of the complexity and dynamic nature of social and natural systems, sustainable forestry must be flexible and adaptable necessitating adaptive management (Abubakr *et al.,* 1997; Crafter *et al.,* 1997; Geldenhuys, 2002, 2003). University researchers, industry and natural resource agencies will have time to develop long-term partnerships for evaluating the criteria and indicators of sustainable forest management (Abubakr *et al.,* 1997; Crafter *et al.,* 1997; GOS, 2002b)

Most contemporary national forest policies resulted in the establishment of a number of working strategies, programmes and administrative structures to ensure the long-term sustainability of forest resources. This is mainly through empowering local communities to design effective approaches when addressing forest management concerns.

All stakeholders in the forestry sector have a role to play in long-term sustainability of the resources, and these include local communities (adjacent to the natural forests and woodlands), forest industries (in commercial forestry), municipalities (involved with urban forestry/greening), government (policy makers) and other interested parties (Abubakr *et al.,* 1997; Crafter *et al.,* 1997; Prasad, 1999; GOS, 2002a; Nibbering and Samyn, 2002; Sreedharan, 2002).

Community participation in forest management is the trend in Africa and beyond (Crafter *et al.,* 1997; Wily, 2002; Geldenhuys, 2003). A recent overview showed that participatory forest management (PFM) in Africa is sufficiently widespread and effective to be recognized as a significant route towards securing and sustaining forests (Wily, 2002). While each state is striving for more participatory approaches to especially natural forest management, broad commonalities among the processes and paradigms are notable. The issue of PFM is in short democratisation in the forestry sector, which is an important socio-political transformation towards more inclusive norms in the governance of society and its natural resources (Grundy and Breton, 1998; Prasad, 1999; Nibbering and Samyn, 2002; GOS, 2002a; Sreedharan, 2002).

An analysis of stakeholder power and responsibilities in community involvement in forest management in eastern and southern Africa showed that the common trend within Forestry Departments as well as some Wildlife Conservation Authorities, throughout the region, is to enter into collaborative management agreements with local communities living in and around indigenous state Forests (Grundy and Breton, 1998; Barrow *et al.,* 2002). The intention of collaborative forest management is to increase local community stakes in forest reserves through negotiated and linked mutual rights and responsibilities (Mogaka *et al.,* 2001; Barrow *et al.,* 2002).

Benefits of PFM may be summarized as: poor local communities adjacent to natural forests and woodlands are promoted to the position where they are in control of the resource with long-term perspectives; declaration and demarcation of 'community forests' to remove them from open-access ills so widely associated with public properties; democratisation leading to wider local governance development; emergent land reform processes are encouraged through PFM programmes in the world; and PFM goes beyond forest conservation or livelihood into issues of more inclusive and effective management of society itself (PFM is part of social transformation) (Mauambeta, 2000; Milol, 2000; Montagne and Mamoudou, 2000; Nana, 2000; Mushove, 2001).

Non-timber forest products are important to joint participatory forest management (JPFM) in the following ways: they are integral to the lifestyle of the forest dependent communities, as they fulfil basic requirements; NTFPs have an advantage over timber in terms of the time needed to achieve significant volumes of commercially valuable production (they become available even in the early stages of a rehabilitation of degraded forest areas). In countries like India about 50% of forest revenue and about 70% of forest export revenue comes from NTFPs (Campbell *et al.,* 1997). NTFPs management and development therefore have clear

ecological, social and economic benefits. It is necessary to understand how rural communities think about participatory approaches to resource use and management.

4.2 SPECIFIC OBJECTIVE

To embark on community consultations to gather information on the communities' perception of preferred edible and medicinal NTFPs, their direct uses, the existing management strategies, and the threats to forest biodiversity and the domestication and commercialisation initiatives.

4.2.1 Associated Research Questions

- ✓ Are the local people conversant with existing policies and legislation that affect the NTFP sector? If not, what are the factors leading to this and what strategies can be developed to ensure optimisation of these policies for equitable and sustainable development of NTFPs at the local level?
- ✓ What are the potential threats to forest biodiversity that can lead to the loss of these NTFPs?
- ✓ Are there existing local level traditional management plans for the natural forests and woodlands and national policies and legislation that safeguard the sustainable extraction of edible and medicinal NTFPs?
- ✓ Are the local people really aware of the opportunity cost of the surrounding natural forests and woodlands?
- ✓ Are the local people willing to put some effort into the conservation of natural forest and woodlands for the sustainable supply of timber and NTFPs?
- ✓ What domestication and commercialisation initiatives are in place for edible and medicinal NTFPs?

4.2.2 Hypothesis to be tested

Hypothesis: There are no existing traditional forest management plans that can complement the National Policies

4.3 METHODS

4.3.1 Selection of the study sites

The study sites were selected according to two key criteria:

1. They had to cover a broad spectrum of sites, to allow calculation of variance. This was ensured by covering the four ecological zones of the country (modified from Godoy *et al.,* 1993; FAO, 2001). This makes it possible to use data for comparison and generalization and the full range of Swaziland's major forest types, with their associated variability in climatic and socio-economic conditions (modified from Hassan *et al*., 2002);
2. The selected villages had to be part of communities that live adjacent to natural forests and woodlands and harvest, extract or collect and utilize NTFPs from the neighbouring natural forests and woodlands (modified from Appasamy, 1993; Godoy and Bawa, 1993; Hall and Bawa, 1993; Hedge *et al*., 1996; Shackleton, 1996; Campbell *et al*., 1997; Crafter *et al*., 1997; Qureshi and Kumar, 1998; Shackleton and Shackleton, 2000; Shackleton *et al*., 2002; Dovie, 2003b). Only rural communities/villages were included in the study due to the low dependence of urban populations on direct harvesting of NTFPs from natural forests and woodlands (Hassan *et al*., 2002).

Based on the above criteria the following areas, each with two villages, were studied (Table 4.1):

1. Grand Valley/KaKholwane (Middleveld)
2. Shewula Nature Reserve/KaShewula (Lubombo)
3. Siphofaneni (Lowveld)
4. Hhelehhele North (Highveld)

The major land uses in the sites are dominated by subsistence crop farming and communal livestock rearing.

Table 4.1: The study sites selected for Community Consultations

Ecological zone	Area (site)/Community	Village
Highveld	Hhelehhele North	✓ Mlumati ✓ Hhelehhele
Middleveld	Grand Valley (KaKholwane)	✓ Emoti ✓ Kundodemnyama
Lubombo	KaShewula	✓ Jamehlungwini ✓ Mangwenya
Lowveld	Siphofaneni	✓ Hlutse ✓ Madvuma

4.3.2 Community Profiles

The communities studied comprised mainly illiterate representatives, who came from relatively poor rural households. Most of the households practise livestock and crop farming at the susbsistence level, and harvest NTFPs. Most of the community representatives were old and unemployed people. From each area 20 men and 20 women were included in the survey. A summary of the community profiles is presented in Table 4.2.

4.3.3 Sampling procedure

Four communities depicted by study area/community in Table 4.1 were studied and only two villages were selected under each.

The sampling procedure was guided by the following:

(1) The District Forestry Officer in each study area, in consultation with the District Agricultural Extension Officers, was requested to select only two villages appropriate for this study in accordance with selection criterion 2 under section 4.3.1;

(2) A total of 40 community representatives, in each study area, were shortlisted from 40 households to participate in the community consultation meetings by the District Forestry Officer in close cooperation with the District Agricultural Extension Officers. The criteria used in choosing community representatives, amongst other factors, included their track record in attending other community development meetings and active participation in rural development programmes, gender (50% men and 50% women), age, and harvesting of NTFPs. In addition, at least two community leaders were invited as observers.

Table 4.2: Community Profiles (at the level of household) in the various study areas

Factors	Hhelehhele North	Grand valley	KaShewula	Siphofaneni
Human population density	1188 in 181 households	1490 in 220 households	841 in 87 households	1151 in 169 households
Employment levels	100% unemployed	100% unemployed	100% unemployed	100% unemployed
Education levels	87.5% illiterate	80% illiterate	77.5% illiterate	90% illiterate
Age	20 to 60 years	20 to 74 years	19 to 68 years	25 to 72 years
Reliability of Food Aid Programmes	Unreliable food aid programmes	Unreliable food aid programmes	Reliable food aid programmes	Reliable food aid programmes
Proximity to Health Care Centres	Easy access to health care centres	Health care centres are far and access is difficult	Health care centers are far and access is difficult	Easy access to health care centres
Livestock	6 goats, 7 cattle and 30 chickens	11 goats, 8 cattle and 23 chickens	9 goats, 8 cattle and 21 chickens	8 goats, 7 cattle and 31 chickens
Crop farming	Maize, ground nuts, sweet potatoes, vegetables, paw-paw, banana, oranges, other	Maize, water melons, pumpkins, ground nuts, potatoes, cassava, beans, other	Cotton, maize, some legumes, other	Maize, ground nuts, cassava, sorghum, sweet potatoes, other

4.3.4 Data collection

Community consultations were held in the following centres: Shewula Mountain Camp Conference Centre (Shewula-Lubombo); Siphofaneni RDA (Siphofaneni-Lowveld); Church of the Nazarene (KaKholwane-Middleveld); and Hhelehhele North Umphakatsi (Hhelehhele North-Highveld). A total of 4 meetings per study site were conducted. There were three programmes (group work, individual responses and discussion of National Forest Policy) undertaken in each study area:

4.3.4.1 Group Discussions

The following questions were posed to the group for submission of group perceptions on the issues raised:

(a) What are the major landuses in the area?
(b) Are there national policies and laws governing the adjacent natural forests and woodlands?
(c) What are the current traditional species utilization and management programmes?
(d) What are the threats to forest biodiversity?

(e) Are the local people willing to participate in natural forest conservation?
(f) Are the local people aware of the opportunity cost of the adjacent natural forest and woodland resources?
(g) Is there a domestication and commercialisation potential for NTFPs in the area?
(h) Which natural forests and woodlands can be considered or nominated for research and development?

Community volunteers who are willing to participate in a proposed resource survey and user survey were named in the meetings. The group perceptions were recorded and later summarized and presented under results.

4.3.4.2 Individual Perceptions

The following set of questions was formulated and posed to the community representatives on an individual basis, in each study site:

(a) What are the most preferred edible NTFPs?
(b) What are the most preferred medicinal NTFPs?
(c) Which indigenous edible and medicinal NTFPs are threatened?
(d) Give a list of the top priority desired edible and medicinal NTFPs that are worthy of immediate domestication and commercialisation (Refer to Appendix 11 for a specimen of the data collection form).

The list of responses was compiled and analysed.

4.3.4.3 Review of the current National Forest Policy

Step one:
The SiSwati version of the NFP was read and discussed during a community consultation meeting in all the study sites.

Step two:
The policy issues and statements on Natural Forests and Woodlands were given special consideration and the communities were to develop guidelines for the management of their natural forests and woodlands in relation to those in the new NFP.

Step three:

Summaries of their views were fully captured and recorded. The community consultations were conducted between July 2003 and October 2003. This was during the winter and spring seasons when farmers were not busy.

4.4 DATA ANALYSIS

4.4.1 Group Discussions

The issues and comments raised by the group of community representatives for each question asked were compiled for each study area.

4.4.2 Individual Perceptions

The data collected on all the responses was compiled, sorted and coded, stored in Excel and analysed. The data was of binomial type and the incidence of people (denoted as percentage) was subjected to analysis of variance (4-factor factorial experiment in a one-way classification design), using SAS version 8.2 (SAS, 1999). The statistical model used, was:

$Y_{ijkln} = \mu + \alpha_i + \beta_j + \gamma_k + \delta_l + \alpha\beta_{ij} + \alpha\gamma_{ik} + \alpha\delta_{il} + \beta\gamma_{kl} + \beta\delta_{jl} + \gamma\delta_{kl} + \varepsilon_{ijkln}$

Where:

μ =population mean

α_i = product effect (site or species or community)

β_j= site effect

γ_k = species

δ_l = gender

$\alpha\beta_{ij}$ = product * Site effect

$\alpha\gamma_{ik}$ = product * species

$\alpha\delta_{il}$ = product *gender

$\beta\gamma kl$ = site *species

$\beta\delta_{jl}$ = site * gender

$\gamma\delta_{kl}$ =species * gender

ε_{ij} = error

The higher order interaction were used as part of error ($\varepsilon ijkln$)

The Shapiro-Wilk test was performed to test for non-normality (Shapiro and Wilk, 1965). In some cases where evidence of non-normality was found, it was due to high kurtosis and not skewness. A magnitude of similar values was responsible for the kurtosis. According to Glass *et al.* (1972) the analysis is valid. Student's t-Least Significant Difference was calculated at the 5% confidence level to compare main factor means (e.g. products, sites, gender, species).

4.4.3 Review of current National Forest Policy

The issues raised by communities on local-level sustainable forest management, after the discussion of the NFP were summarized for the entire country, and the full range of original submissions from individual study sites was also kept for reference on specific issues of concern by site through the four ecological zones of Swaziland.

4.5 RESULTS

4.5.1 Group Discussions

Four full-day meetings were conducted per study site, as planned. It was remarkable to note that the target participants and observers were in attendance with a 100% turn-up in all the four study sites. However, it was also observed that due to unforeseen circumstances and social commitments the composition of the participants was changing in every subsequent meeting, but the total number and gender still remained at 20 men and 20 women as earlier planned.

4.5.1.1 Threats to forest biodiversity

The communities in the various study areas reported a number of threats to forest biodiversity. Responses per study area are presented in Table 4.3. Most threats were reported only in one of the four study areas. The responses depict the number of community representatives that raised and supported specific issues (i.e. threats). For example 40/40 community respondents raised Alien Invasive Species as a threat to forest biodiversity at Hhelehhele North, Grand Valley and KaShewula). The most common threats were alien invasive plants and drought.

Table 4.3: The reported threats to forest diversity from Community Consultations in the four ecological zones of Swaziland

THREATS	% RESPONSES (OUT OF A TOTAL OF 40 REPRESENTATIVES PER SESSION) IN STUDY SITES OVER THE FOUR ECOLOGICAL ZONES			
	Hhelehhele North	Grand Valley	Siphofaneni	KaShewula
Alien Invasive Plants	100	100	0	100
Biopiracy	22.5	0	0	0
Desertification	0	0	47.5	0
Drought	100	0	0	100
Encroaching species	0	85	0	0
Farm structures	0	0	57.5	0
Fire arms	0	12.5	0	0
Forest Fires	72.5	0	0	0
Fuel wood	0	0	67.5	12.5
Ignorance of laws	0	80	0	0
Overstocking	0	72.5	0	0
Population explosion	0	0	80	0
Sugarcane farming	0	0	92.5	0
Traditional healers	37.5	0	0	0
Warthogs	12.5	0	0	0
Wood crafts	0	0	0	30

NB. Encroaching species in this regard refers to *Dichrostachys cinera*

4.5.1.2 Traditional species management systems

Traditional authorities are responsible for the local-level management of natural forests and woodlands, which entails the sustainable harvesting of forest foods and forest medicines and other timber and NTFPs. Over the years there was a steady decline in the supply of NTFPs from natural forests and this is attributed to the issues highlighted in Box 4.1.

4.5.1.3 National Policies and legislation

The communities are not versed with any functional and nominal national and international policies and legislation that govern the extraction of natural forest products in the adjacent natural forests and woodlands. About 47.5%, 37%, 100% and 100% of the responses were that there are no policies and legislation governing the use of NTFPs, in Hhelehhele North, Grand Valley, Siphofaneni and kaShewula, respectively.

Box 4.1: Existence of Traditional Species Management in the various communities

- ✓ **Hhelehhele North-Highveld**: The Traditional Authorities are responsible but communities do not cooperate.

- ✓ **Grand Valley/Kakholwane-Middleveld**: There were stringent policies and laws against the felling/cutting of edible trees, felling of trees for fuel wood, woodcrafts, and medicinal purposes. These are now outdated. They are not documented and the youth challenge them and violate them.

- ✓ **Siphofaneni-Lowveld**: None at present, heard about the Forest Act of 1910 and traditional authorities used to enforce, but now it is outdated and there is nothing protecting forests

- ✓ **KaShewula-Lubombo**: Traditional policies and laws are in place except that the youth violate them, but penalties are imposed on offences of misuse of forests

This is regardless of the series of national policies and legislation that government has developed and the international conventions that government has signed and ratified. In the Grand Valley area 22.5% of the responses mentioned that misunderstanding and strict enforcement of the Grass Fire Act of 1955 has lead to dense natural woodlands and displacement of grasses, which is a sign of a disturbed ecosystem. However, all the communities studied wished there were effective policies and laws to govern the sustainable use of natural forest and woodlands to prevent the gradual loss of forest bio-diversity. They expressed 100% support to save the dwindling natural woodlands for the remaining species of timber and NTFPs.

4.5.1.4 Opportunity cost of the forest

Some local people are aware of the economic value of the adjacent natural forests and woodlands. Hhelehhele North, Siphofaneni and KaShewula had 72%, 57.5% and 92.5% responses admitting that people are aware of the opportunity cost of the forest, while 35% responses in Grand Valley suggested that people needed to be educated about the concept.

4.5.1.5 Domestication and commercialisation of indigenous NTFPs

Only Shewula community has established a pilot nursery for the domestication and propagation of indigenous plants of socio-economic importance. The Hhelehhele North communities have established a community woodlot for valuable indigenous hardwoods (i.e. *Breonadia salicina, Brachylaena ilicifolia, Umlindzangulube and Indluyentatsi*), and are also

in the process of establishing orchards for indigenous edible species. All these intiatives are under the Chief‟s management.

The other communities in the Grand Valley/KaKholwane and Siphofaneni study sites do have priority species (*Syzygium cordatum and Berchemia zeyheri*) for domestication and mass propagation but do not have any formal domestication programmes yet. It is encouraging that they are willing to embark on such programmes soon. All the communities are willing to embark on massive domestication and commercialisation programmes. Hhelehhele North, Grand valley, Siphofaneni and KaShewula had 62.5%, 77.5%, 47.5% and 67.5 % positive responses for implementing NTFPs domestication initiatives.

4.5.1.6 Resource use

Detailed information on the various NTFPs and the species used in the studied areas, obtained through the community consultation meetings, is contained in Appendix 10 and summarized in Table 4.4. The Siphofaneni site in the lowveld has the highest number of harvested edible and medicinal products (mammals, fruits and berries, vegetables, mushrooms, bee honey, insects, caterpillars, wax and medicines), followed by the Shewula site (fruits and berries, vegetables, mushrooms, bee honey, insects, caterpillars and medicines) and the Grand Valley/KaKholwane site (fruits and berries, vegetables, mushrooms, bee honey, wax, caterpillars and medicines). The Hhelehhele North site is last with just fruits and berries, vegetables and medicines.

Table 4.4: Reported number of species in the various study sites - Community Consultations

Product group	Grand Valley	Hhelehhele North	Shewula	Siphofaneni
Edible plant species	38	16	16	20
Edible animal species	4	0	5	7
Medicinal plant species	20	20	13	9
Threatened edible animal species	0	0	0	4
Threatened medicinal plant species	7	5	5	0
Threatened edible plant species	2	1	5	9
Top priority species	5	7	10	15

4.5.2 Individual Perceptions

The communities from the various study sites were further requested to develop lists of species under seven product groups. The product groups were as follows: preferred edible plants species, preferred edible animal species, preferred medicinal plants, threatened edible animal species, threatened medicinal plant species, threatened edible plant species and top

priority species for immediate domestication and commercialisation (Table 4.4). The Grand Valley site listed the highest number of edible plant species and the Siphofaneni the highest number of edible animals, while the Hhelehhele North and Grand Valley sites reported the highest number of medicinal plants. The various study sites have between 5 and 15 top priority species targeted for domestication and commercialisation.

4.5.2.1 Analysis of responses on preferred NTFPs

The results were analysed for Product (7 groups), Site (4), Species (129) and Gender (2). The product groups were edible animals, edible plants, medicinal plants, threatened edible animals, threatened edible plants, threatened medicinal plants and top priority species. A breakdown of the number of species, mean number and standard deviation of responses for product groups is presented in Table 4.5 and for sites presented in Table 4.6. The detailed Analysis of Variance (ANOVA) across sites is shown in Table 4.7, and for individual sites in Table 4.8. Graphical representation of the percentage responses of community representatives for the various product groups within each of the study areas is shown in Figures 4.1, 4.2, 4.3 and 4.4. Please note the dependent variable here in this analysis is %people NOT %species and that top priority species is a product class as per the people's perceptions and not statistically validated.

Table 4.5: The variation in the average number of responses and number of NTFPs species reported during Community Consultations between product categories

Level of product	Number of NTFPs species reported (including repetitions)	Mean number of responses out of a possible 40	Standard Deviation
Medicinal plants	124	28.1 a	1.3
Top priority species	74	27.4 a	1.2
Threatened edible animals	8	26.5 a	1.8
Threatened edible plants	34	25.6 ab	0.7
Edible plants	180	25.1 ab	1.9
Threatened medicinal plants	34	21.6 b	1.4
Edible animals	32	13.4 c	1.3

NB: Means with same letter indicates no differences and different letters indicate differences

Table 4.6: The variation in the number of responses and number of NTFPs species reported during Community Consultations between the various Study Sites

Level of site	Number of NTFPs species reported (including repetitions)	Mean number of responses out of a possible 40	Standard Deviation
Siphofaneni	128	27.7 a	1.1
Grand Valley	152	26.2 a	1.0
Shewula	108	23.4 b	1.2
Hhelehhele North	98	22.6 b	1.4

NB: Means with same letter indicates no differences and different letters indicate differences

Table 4.7: Analysis of variance for community consultations showing the statistical differences (depicted by the p-values) in responses between products, sites, gender, species, and the various interactions: Across Study Sites

Source of variation	Degrees of freedom	Mean square	P-values
Product	6	1058.6	<0.0001**
Site	3	1004.5	<0.0001**
Product*site	13	936.5	<0.0001**
Species	127	436.8	<0.0001**
Site*species	61	147.2	<0.0008**
Product*species	32	249.9	<0.0001**
Gender	1	227.4	0.813ns
Site*gender	3	1108.3	<0.0001**
Product*gender	6	1263.3	<0.0001**
Species*gender	127	190.5	<0.0001**
Error	106	73.4	
Corrected Total	485		

P<0.05=Statistically significant; P>0.05= Not Statistically significant, at 95% Confidence Interval; **= Highly significant; *= Significant; ns= Non-significant.

The ANOVA of overall community consultations across sites shows highly significant differences between products ($p<0.0001$), between Sites ($p<0.0001$), in the interaction between products and sites ($p<0.0001$), between species reported ($p<0.001$), in interaction between sites and species reported ($p<0.008$), in the interaction between products and species reported ($p<0.0001$), in the interaction between site and gender ($p<0.0001$), in the interaction between species and gender ($p<0.0001$), and in the interaction between products and gender ($p<0.0001$). There were no significant differences between gender ($p<0.813$).

The Grand valley site-Middleveld

This site reported 66 of the 129 total species. No threatened edible animals were reported. Gender response was balanced between men and women representatives. In only edible plants were responses by women higher than by men.

The % people in all the study sites refer to the proportion of women or men out of 100% that mentioned a particualar grouping of species. The fourth grouping is for Threatened edible plants.

The Hhelehhele North site-Highveld

This site reported 41 of the 129 total species. No threatened edible animals and edible plants were reported. Gender response was balanced in some cases.

Table 4.8: Analysis of variance for community consultations showing the statistical differences (depicted by the p-values) in responses between products, sites, gender, species, and the various interactions: In Individual Study Sites

GRAND VALLEY SITE (MIDDLEVELD)			
Sources of variation	**Degrees of freedom**	**Mean Square**	**P-values**
Product	5	1125.5	0.0001**
Species	64	360.9	0.0016**
Product*Species	6	184.7	0.0163*
Gender	1	243.7	0.0231*
Product*Gender	5	632.7	0.0007**
Species*Gender	64	114.6	0.0352*
Error	6	26.5	
Corrected Total	151		
HHELEHHELE NORTH SITE (HIGHVELD)			
Sources of variation	**Degrees of freedom**	**Mean Square**	**P-values**
Product	4	753.3	0.0217*
Species	40	426.8	0.0473*
Product*Species	4	22.0	0.8616ns
Gender	1	1653.1	0.0088**
Product*Gender	4	357.6	0.0754ns
Species*Gender	40	144.8	0.2638ns
Error	4	72.3	
Corrected Total	97		
SHEWULA SITE (LUBOMBO PLATUEA)			
Sources of variation	**Degrees of freedom**	**Mean Square**	**P-values**
Product	5	427.1	0.0058**
Species	36	370.3	0.0022**
Product*Species	12	288.8	0.0121*
Gender	1	244.5	0.0920ns
Product*Gender	5	258.4	0.0336*
Species*Gender	36	191.5	0.0379*
Error	12	72.9	
Corrected Total	107		
SIPHOFANENI SITE (LOWVELD)			
Sources of variation	**Degrees of freedom**	**Mean Square**	**P-values**
Product	5	1758.1	<0.0001**
Species	48	228.3	0.0037**
Product*Species	10	333.5	0.0016**
Gender	1	1411.1	0.0002**
Product*Gender	5	812.7	<0.0001**
Species*Gender	48	163.2	0.0137*
Error	10	43.0	
Corrected Total	127		

P<0.05=Statistically significant; P>0.05= Not Statistically significant, at 95% Confidence Interval; **= Highly significant; *= Significant; ns= Non-significant.

The Shewula site-Lubombo Plateau

This site reported 38 of the 129 total species. No threatened edible animals were reported. Gender response was balanced in certain cases.

The Siphofaneni site-Lowveld

This site reported 51 of the 129 species. No threatened medicinal plants were reported. Gender response was balanced in some cases.

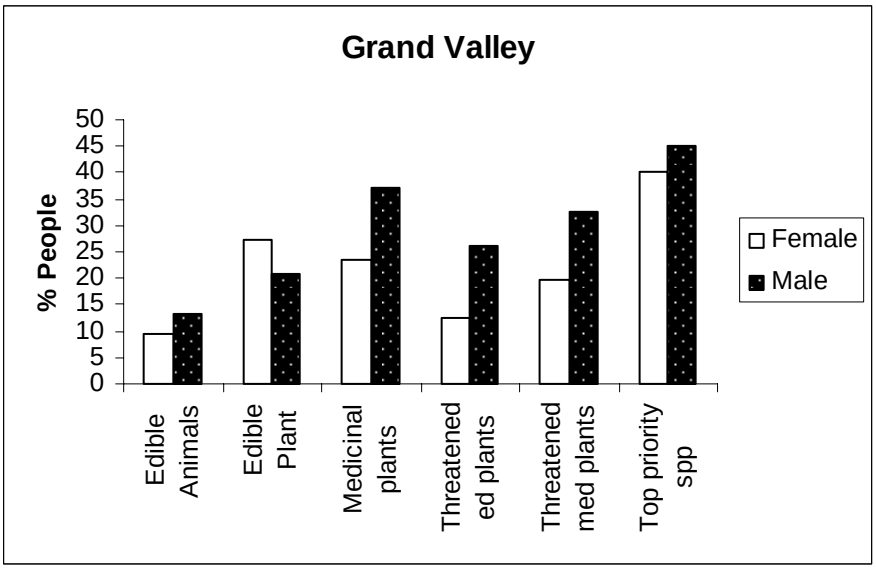

Figure 4.1: Graphical representation of the percentage responses of community representatives for the various product groups at Grand Valley area.

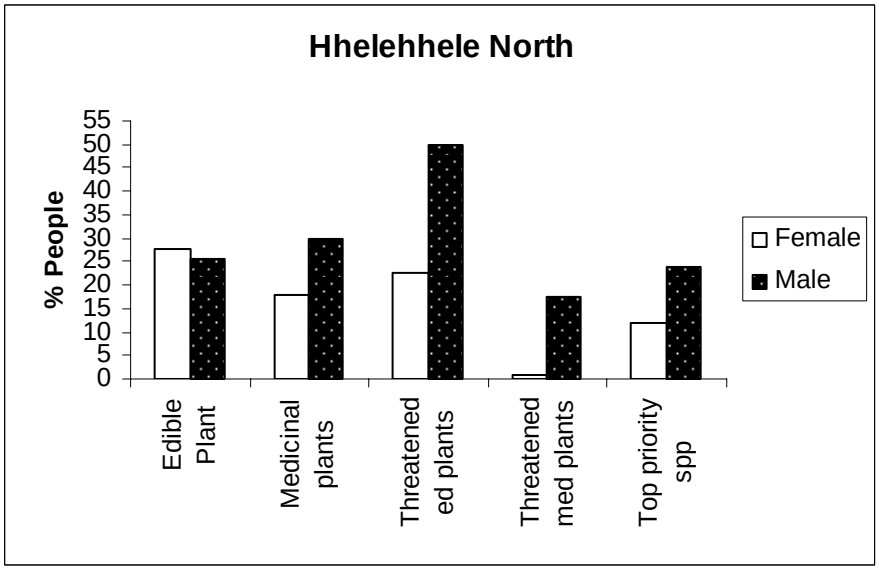

Figure 4.2: Graphical representation of the percentage responses of community representatives for the various product groups at Hhelehhele area.

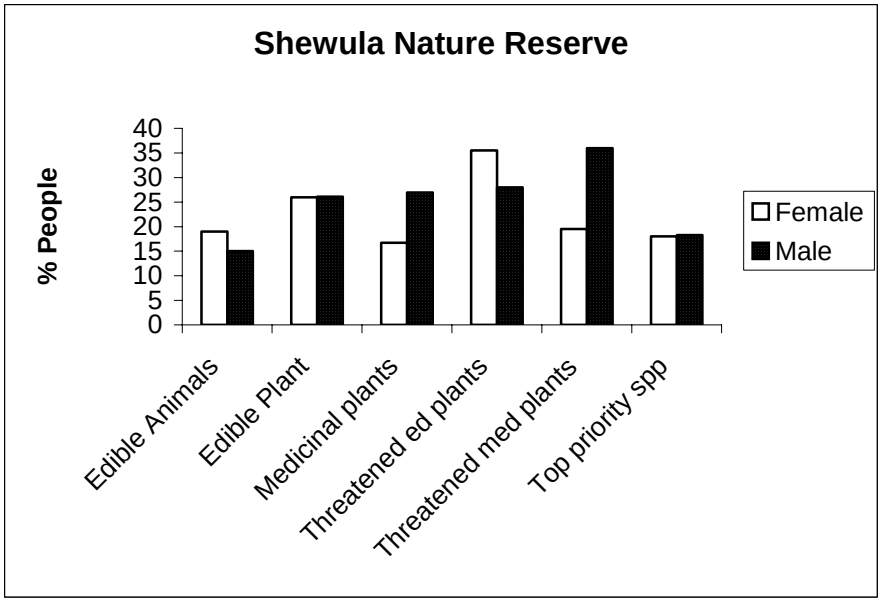

Figure 4.3: Graphical representation of the percentage responses of community representatives for the various product groups at Shewula Nature Reserve.

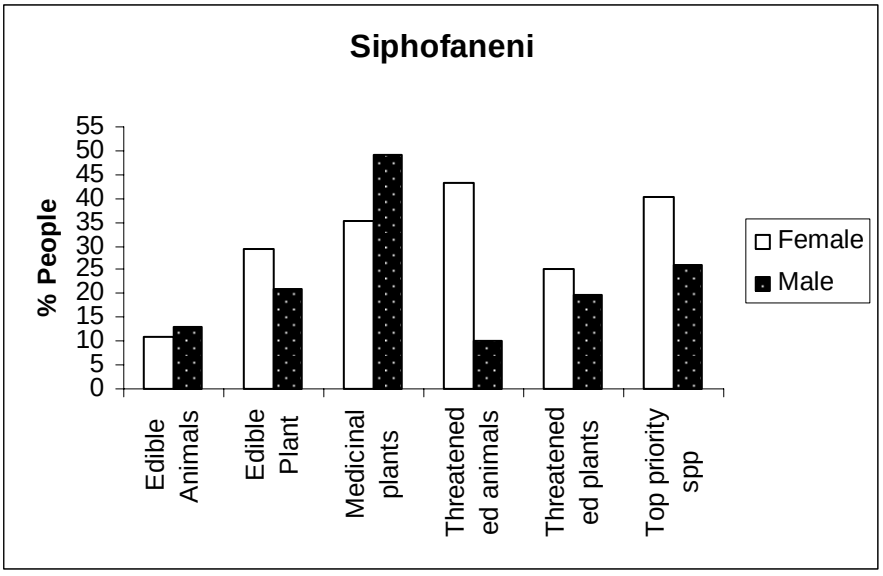

Figure 4.4: Graphical representation of the percentage responses of community representatives for the various product groups at Siphofaneni area.

4.5.3 Review of current National Forest Policy

Concerns with regard to the current status of forest and woodland resources in Swaziland revolve around sustainable management issues. Participants in the various sites made submissions of twenty one (21) issues that need urgent consideration in order to under pin the national efforts and programmes to combat degradation of natural resources and the

environment. Below is an outline of the issues and recommendations that came up during the community consultations study. A detailed breakdown of submissions made at individual sites is presented in Appendix 8.

The 21 issues were divided into the following categories;

A. Institutional Issues
B. Socio-cultural Issues
C. Environmental and Ecological Issues
D. Socio-economic Issues
E. Policy Issues

4.5.3.1 Institutional Issues

Community-based Natural Resources Management Committees

Community response: The communities feel that if government and other development agencies would facilitate the establishment and implementation of a community-based natural resources management programme, with local-level community-based natural resources management committees, the regulation and monitoring of NTFPs could be greatly enhanced. Currently the people said there is no control over the unsustainable harvesting of edible and medicinal NTFPs.

4.5.3.2 Socio-cultural Issues

Modern Agro-forestry Systems

Community Response: The community representatives said that land has become a scarce resource in their communities and as such there is strong desire for them to learn and adopt new integrated land utilization methods such as advanced modern agro-forestry systems to maximize the output per given portion of farm land. This would further relieve the pressure on natural woodlands since people would concentrate on agricultural produce instead of harvesting forest foods and forest medicines thus allowing a steady recovery of the degraded natural woodlands.

Empowerment of Chiefs

Community Response: Local chiefs lack the powers to control the harvesting of indigenous forest products, and as a result there is over-exploitation of forest products in the natural

woodlands adjacent to all the communities studied. The community representatives suggested that government should consider empowering local chiefs and their inner councils in issues pertaining to sustainable harvesting of forest products. The participants further said that the support of the members would strengthen the chief's powers to control and regulate the flow of resources from the natural woodlands.

Incentives for Chiefs

Community Response: Local chiefs are not paid any allowances or salaries by the state. This has lead to the poor chiefs allocating land to people with bribes. Consequently there is a cluster of households within small portions of land resulting in environmental degradation. This has resulted in erosion and loss of forest bio-diversity causing irreversible environmental crisis.

Youth Environmental Programmes

Community Response: Communities need government and NGO support to form community-based youth environmental management programmes. The youth are implicated in the unsustainable harvesting of forest foods and other forest products. They challenge their parents' indigenous traditional forest management systems and claim these are not documented and are unfounded and baseless. Parents feel these children could learn better from modern youth environmental management programmes lead by government and NGO's. The youth, being the most active group in the society and the people to lead the future of this country, are the best group to be engaged in environmental management programmes.

4.5.3.3 Environmental and Ecological Issues

Alien Invasive Plants Strategy

Community Response: Alien invasive plant species were reported to be a natural disaster where invasive species are threatening to completely displace indigenous flora in all the ecological zones of the country. The drastic effects of *Chromoleana odorata, Lantana camara, Sesbania punicea, Solanum mauritianum, Caesalpinea decapetala, Pathenium hystorophorus, Rubus spp., Psidium guajava, Opuntia imbricata* as well as other alien plant species can be observed in the natural woodlands where indigenous flora has been literally displaced. The participants further suggested that government and other development agencies should formulate a national strategy and action plan for the control of alien invasive

species that would ensure that these invaders are eradicated before the forest biodiversity is completely eroded.

Forest Fires

Community Response: Unprescribed burning or uncontrolled forest fires and wild forest fires were highlighted as one of the major threats to the continued existence and health of the natural forests and woodlands in all the study sites. There was a recommendation that law enforcement should be strictly practiced to curb the malpractice of wild fires by certain irresponsible members of the community. Law enforcement is working successfully in the Grand Valley site (at KaKholwane), though sometimes misunderstanding of certain laws has lead to zero burning of woodlands thus leading to overwhelming bush encroachment.

Species Re-introduction and Replanting Programmes

Community Response: Participants submitted that indigenous plant species that produce edible and medicinal NTFPs are steadily getting diminished and extinct. In consideration of the socio-economic role of these forest products the communities recommended that the issue be taken up with government and other development agencies to initiate a vigilant species re-introduction and re-planting programme covering the entire forest strata in four ecological zones of the country, with supporting sub-programmes on the establishment of protected clonal and seedling seed orchards at the community or village level.

4.5.3.4 Socio-economic Issues

Eco-tourism

Community Response: Introduction of appropriate non-consumptive community-based eco-tourism projects by government and other development agencies was raised as one of the likely activities to combat natural forest and woodland degradation in the various study sites. These projects would ensure the protection and preservation of rich biological diversity for the aesthetic value of the natural woodlands and remnant natural forests.

Alternative Livelihood Options

Community Response: Poverty and unemployment are seen to be major mechanisms leading to the unsustainable harvesting of timber and NTFPs in rural Swaziland as perceived by the

communities studied. People harvest edible forest products for domestic consumption and trade for cash income, mainly on roadside markets, and harvest forest medicines for domestic use and trade in the main city markets. They also harvest fuel wood for domestic use and for sale on the roadsides. This has resulted in over-exploitation of the forest resources and causes forest degradation and biodiversity erosion. The communities made a recommendation that government and developmental agencies are urged to collaborate in establishing rural economic empowerment programmes and projects to provide alternative livelihoods in order to relieve pressure on natural woodlands.

4.5.3.5 Policy Issues

National and International Policies and Legislation

Community Response: Community members clearly stated that they are not well-versed with the relevant nominal and functional national and international policies and legislation that govern the use of natural resources such as natural forests and woodlands. This implies that during the policy formulation processes the resource users were not part of the stakeholders.

Forest Reserves

Community Response: Community representatives raised the issue of the establishment of community-based natural forest reserves for the protection of the dwindling floral and faunal bio-diversity in their neighbouring woodlands. The Shewula community in the Lubombo ecological zone is a good example and a living specimen of a community-based natural forest reserve, which is the first in the history of the country and appears to be a very successful initiative indeed.

Harvesting Monitoring

Community Response: Lack of monitoring of the harvesting of medicinal plants leads to the prevailing unsustainable exploitation of these natural resources. A key threat to the harvesting of forest medicines is that of non-resident collectors who extract huge quantities of medicinal plants usually at night. These collectors destroy the whole plant by uprooting it and carrying it away yet they may use a few branches. The meeting participants felt there is also a strong need to sensitise traditional healers and herbalists about local-level sustainable forest management through sustainable harvesting of forest medicines. Traditional healers and

herbalists need to be trained on the best practices in extraction of forest medicines by trained personnel from the Ministry responsible for Forestry and Bio-diversity Management.

Education and Awareness

Community Response: Communities feel the current education, awareness raising and capacity building programmes are not effective enough as natural woodland degradation continues to occur steadily across the four ecological zones of the country showing some obvious signs of irreversible environmental hazards such as rills and dongas. In view of the prevailing situation of forest degradation and forest bio-diversity erosion the communities suggested that government and lead NGO's should formulate and implement effective education, awareness raising and capacity building programmes on natural resources management for natural forests and woodlands.

Matching Resource Use with Resource Availability

Community Response: The communities mentioned that matching forest resource use with resource availability is one of the most reliable prospective strategies to regulate and monitor the flow of forest products from the forest to the village households. Periodical resource surveys and user surveys by the communities, with the assistance of the Ministry responsible for Forestry, was seen to be the best mode of affecting this strategy.

Alternative Sources of Energy

Community Response: The unsustainable extraction of fuel wood from natural forests and woodlands has posed a great threat to the continued existence of these natural resources that house a broad spectrum of rich floral and faunal bio-diversity. The practice of fuel wood extraction is overwhelming throughout the country and this has resulted in irreversible environmental hazards like excess run-off causing incredible soil erosion that is seen in rills and galleys that finally lead to siltation of surface water sources. This further results in serious loss of forest bio-diversity and extinction of natural forest food and medicine species. Communities recommended that the promotion of sources of energy other than fuel wood would relieve the pressure on natural woodlands.

Forest Act

Community Response: The meetings concluded that local-level sustainable forest management may not be realized in the absence of an effective Forest Act in Swaziland. The Forest Act is expected to strictly prohibit the felling of edible and medicinal as well as other multi-purpose trees and shrubs.

Development Projects versus Natural Woodlands

Community Response: Participants from the Siphofaneni area, in the Lowveld, have noted with disappointment the way in which sugar cane projects are displacing natural forests and woodlands in the area. They mentioned that a number of indigenous forest foods and medicines have been eliminated in the area due to land conversion to developmental projects.

Gender, Biodiversity and Local Knowledge Systems

Community Response: In view of the potential of integrated natural resource management programmes as highlighted in the various national policy documents that the communities were briefed about, it was suggested that a vigilant gender, biodiversity and local knowledge system should be put in place where all these elements would be linked together for enhancement of food security in the communities. Communities felt that women should be encouraged and given the chance in natural resources management and agro-biodiversity conservation. Similar views were echoed by P.J. Musi (personal communication, University of Swaziland, 2004).

Resettlement Programmes

Community Response: Communities raised the issue of uncontrolled human settlements that are haphazard and scattered all over the natural forests and woodlands. They highlighted the negative effects of these settlements on natural forests, mainly through land clearing for agriculture and the escalated harvesting of forest resources to sustain the livelihoods of local people.

Sustainable Natural Resources Management Briefs

Community Response: The communities would prefer to have short presentations, speeches and briefs on contemporary issues of natural resources management and conservation at the

dipping tanks, cooperative societies and associations where old citizens normally meet as well as young citizens that are not attending schools. The people think this would benefit them since they are the direct resource users.

4.6 DISCUSSION

The results of the study show that the major land uses in the four study sites are more inclined to traditional subsistence and pastoral farming, where there is communal grazing of livestock from various homesteads. The literacy levels of the participants were low, as most people, especially the old men and women, never went to school. All the community members who participated in the community consultation meetings were unemployed, and only earned a living through subsistence farming and harvesting of forest products from the adjacent forests and woodlands. These products include indigenous medicines, wild food resources, woodcarvings, and construction material. This is the part of the country where about 75% of the entire population reside (GOS, 1999). In similar studies, Dovie *et al.* (2001), Dovie (2003b), Shackleton (1996), Shackleton and Shackleton (2000, 2002, 2004, 2005) and Shackleton *et al.* (2000, 2002) reported that the majority of South Africans reside in the rural areas characterized by limited infrastructure and unemployment opportunities. Many therefore, make extensive use of NTFPs as part of their daily livelihoods. Rapid population growth and increasing poverty of the population has caused tremendous pressure on natural forests and woodlands to meet its subsistence needs and generate income as stated by Nibbering and Samyn (2002).

The threats to forest biodiversity and recommendations mentioned are similar to those in the National Forest Policy, National Environmental Policy and the National Biodiversity Strategy and Action Plan. Threats to forest biodiversity in Swaziland include encroachment, herbivory by livestock, uncontrolled fires, frequent drought and unsustainable exploitation of natural forest and woodlands. Land conversion to agriculture, infrastructure and uncontrolled resettlement are other threats to forest biodiversity (GOS, 1999, 2001a, 2002b). There is a strong need for development programmes to address these issues. Such programmes and projects should include the control of invasive species, the control over the use of certain endangered species, the control of forest fires and the reduction of overstocking and overgrazing. These programmes need to be developed in conjunction with the NBSAP. Also important is the Environmental Impact Assessment (EIA) and Natural Resources Accounting (NRA) to monitor the authenticity of land conversion and alleviate loss of forest biodiversity. The NRA will give the communities/resource managers a good picture of the opportunity cost

of the adjacent natural forest and woodlands, while the EIA will give a good picture of the biodiversity status of the natural forests and woodlands. Similar observations were made by Godoy *et al.* (1993, 2000) based on 24 studies on NTFPs analysed at the Harvard Institute for International Development.

The status of domestication and commercialisation in the study sites shows that the country is behind the rest of the SADC member countries. Most of the neighbouring countries have embarked on massive domestication and commercialisation programmes and projects. Swaziland might benefit from the CPWild project (CP Wild, 2004), which is seeking to establish a commercialization and domestication initiative that focuses on South Africa, Namibia, Botswana, Zimbabwe, Malawi, Mozambique, Swaziland and Lesotho. Their main aim is to develop the use of natural forest and woodland resources for socio-economic benefit in the SADC region of Africa. The willingness of the communities to participate in the sustainable management and conservation of natural forests and woodlands is a positive step considering the contemporary Participatory Forest Management approach towards SFM. This is seen in the 100% attendance and participation of community reps reported in section 4.5.1.

Forests and woodlands play a significant role in supplying fuelwood for energy and about 70% of rural households in Swaziland rely on fuelwood, and this percentage is expected to remain high for some time (GOS, 2002a). Fuelwood consumption estimates are consistent but there are clear indications that local shortages prevail, especially in the Upper Middleveld and parts of the Lower Middleveld and Lowveld, particularly in dense settlements and arable areas (Lasschuit, 1994, 1995). Supplementary sources of fuelwood are the private and communal wattle forests, though not always on a sustainable basis. Issues of other sources of affordable energy need to be promoted and these are addressed by the draft National Energy Options Paper. Trade in fuelwood and charcoal from indigenous species has exacerbated the over-exploitation of these natural resources leading to forest degradation. The new National Forest Policy outlines other sources of fuelwood and ways to increase supply and energy efficiency that include the following:

1. Increased and improved distribution systems of wood waste from commercial plantations;
2. More efficient use and management of wattle forests;
3. Enrichment planting of selected fast growing natural tree species in the degraded natural forests and woodlands;
4. Buffer-zone planting of suitable exotic species to protect natural forests and woodlands;

5. Establishment of multipurpose woodlots;
6. Increased individual tree growing and Agro-forestry;
7. Agricultural residues, industrial wood waste and baggase from the sugar industry;
8. Charcoal in specific locations, such as from Highveld wattle forests and bush encroachment on farms;
9. Increased energy efficiency through improved wood stoves; and
10. Eradication programmes of harmful alien invasive plant species.

The above options have different potentials and need further evaluation.

The communities from the various study sites reported several preferred species of edible and medicinal NTFPs, the threatened species under each product group, and the top priority with regard to immediate domestication and commercialisation (see Table 4.4). The current study was confined to only forest foods and medicines due to time and finanancial constraints. However, these products were studied in finer detail as the status of various reported species was investigated. Studies in the Republic of South Africa done by Shackleton and Shackleton (1997, 2004, 2005) and Shackleton *et al.,* (2002) also highlighted several NTFPs resources that are utilized by rural communities, i.e. fuelwood, construction wood, edible fruits, edible herbs, edible insects, medicinal plants, bush meat, honey beer, reeds for weaving and grass hand brushes. Most of the NTFPs species reported in South Africa are also extensively utilized in Swaziland as well, according to the list of species reported in the community consultations (Appendix 5).

The Grand Valley site reported a significantly higher number of edible species (Table 4.4) This area falls within the mixed woodland zone, which is the richest in botanical diversity in the entire country (Hess *et al*., 1990; DANCED 1999). The findings of this study are in full agreement with the previous national forest inventories. All the sites reported more than five top priority species that are candidates for domestication and commercialisation. This means local, national, regional and international initiatives and programmes towards domestication and commercialisation of indigenous NTFPs will be greatly appreciated and will receive full cooperation of the communities. There were differences in the information reported by men and women, and that confirms that both genders may not have the same practical experience with the surrounding natural forests and woodlands. Though, during the meetings women showed more interest and knowledge about edible species than medicinal species, and men were more inclined towards highly economic medicinal species. Only the Siphofaneni communities mentioned threatened species of edible animals, and these were: edible

caterpillars, locusts and termites. The implications are that in the other study sites the species of edible products are either abundant or most likely extinct.

Overall commonly reported preferred edible NTFPs include the following: *Sclerocarya birrea, Berchemia zeyheri, Strychnos madagascariensis, Strychnos spinosa, Englerophytum natalense, Aloe maculata, Syzygium cordatum, Vangueria infausta, Psidium guajava, Psalliota campestris*, edible caterpillars and bee honey. The commonly preferred medicinal NTFPs included the following: *Sclerocarya birrea, Psidium guajava, Berchemia zeyheri, Aloe maculata, Rotheca hirsuta, Pittosporum viridiflorum, Drimia delagoensis, Peltosporum africanum, Aloe spp., Ekerbegia capensis,* and *Hypoxis spp.* Several species are used for both food and medicines, and categorized as multi-purpose species. Some of the preferred species are alien invader species, such as *Psidium guajava.* This shows that some invasive alien species contribute positively to household health needs.

The final programme under the consultations was the review of the SiSwati version of the new National Forest Policy. Simultaneously, the community participants were requested to share their indigenous knowledge and practical experience with the adjacent natural forests and woodlands. A sum total of 21 issues and recommendations were raised pertaining to local-level sustainable forest management in the four ecological zones of rural Swaziland (Appendix 4). Some of the issues raised are addressed by the new Forest Policy. However, in all the study sites the community participants lacked knowledge of any national policies guiding and governing the use of natural forests and woodlands. This will have to be addressed to align the needs of the communities with the requirements of the Forest Policy.

There was very little variation in the issues between sites and as such most of the issues were similar, and these may be made into national issues surrounding the sustainable use and management of natural forests and woodlands for NTFPs.

In summary, the main issues raised in the community consultations were: Community-based Natural Resources Management Committees; Forest Fires; National and international policies and legislation; Species Re-introduction and Replanting programmes; Forest reserves; Empowerment of Chiefs; Alternative forms of livelihood; Monitoring of harvesting; Education and awareness; Eco-tourism; Matching resource use and resource availability; Alternative sources of energy; Forest Act; Environment Impact Assessment; Natural Resource Accounting; Agro-forestry; Gender; Biodiversity and Local Knowledge Systems; Resettlement; Youth Environmental Programmes; Incentives for Chiefs; and Sustainable

Forest Management Briefs/presentations. These issues are addressed by the activities and objectives of the following national policies:

1. National Forest Policy
2. National Tourism Policy
3. National Biodiversity Strategy and Action Plan
4. National Land Policy (draft)
5. National Resettlement Policy (draft)
6. National Energy Policy (draft)
7. National Action Plan for the Convention to Combat Desertification

Collaboration between the institutions responsible for the implementation of the above national programmes is imperative for local-level sustainable forest management to be successful. The results of the study reflected a total lack of functional traditional species management and utilization systems in all the study sites. This change also affected the political institutions. Chiefs were demoted to powerless figures, as people were more enlightened about their rights. However, the new National Forest Policy has hopes to resuscitate the Chief's powers in monitoring and regulating harvesting of natural forests and woodlands. Consequently, the hypothesis "There are no existing traditional forest management plans that can complement the National Policies" is accepted.

4.7 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study it can be concluded that there is heavy reliance of local communities on natural forests and woodlands for the harvesting of NTFPs. The absence of local level NTFPs management systems and plans and the absence of national and international policies and legislation governing the sustainable use of NTFPs have lead to an increase in the number of NTFPs species that are currently threatened and endangered due to over-exploitation and unsustainable use of NTFPs. The commercialisation of NTFPs has lead to the problem of non-resident extractors (traditional healers and wood cavers, as well as other groups) that has been highlighted to be a threat to forest biodiversity in most communities. The unprescribed and uncontrolled burning systems and heavy infestation by alien invasive species have lead to a rise in veld fires resulting in the decline in forest quality and vitality (manifested by disappearance of important NTFPs species) in adjacent natural forests and woodlands.

The following actions are recommended:

1. Local and national governments, through their tenure reform systems, should formulate laws (legally enforceable rights) that will give resource users and communities the power to exclude and sanction other users, so that resources can be used sustainably;
2. Development of new and innovative up to date feasible forest management strategies is crucial, if the current forest degradation and land conversion is to be put to rest. Securing community rights to trees and other forest products is a recommended route to the greater participation of communities in natural resources management;
3. Local and national governments should develop strong but clear policies and legislation safeguarding the benefits flow. Rights to forests and forest resources should be linked to management responsibilities. Negotiated agreements should be clear, internalised with local resource user ownership;
4. Local and national governments and development organizations should develop and implement policies and legislation to provide secure access and benefits to the people whose livelihoods are dependent on or supplemented by NTFPs; and
5. Local and national governments and concerned development organizations should ensure that stakeholders, particularly collectors, growers and traders, are provided with incentives to sustainably manage NTFPs.

In addition to the above recommendations there is a need to adopt and implement the following steps of contemporary approaches to sustainable use and conservation of NTFPs (modified from Crafter *et al.,* 1997; Geldenhuys, 2003):

(i) Building NTFPs use into management plans;

(ii) Defining the role of governments and NGO's in community participation;

(iii) Addressing policy, legal and institutional issues (policy and legislation, property rights and land tenure systems);

(iv) Promoting education and training at all levels of society.

CHAPTER 5: USER SURVEYS AND ECONOMIC VALUATION

5.1 INTRODUCTION

It is essential to understand and recognize the role that environmental resources play in the provision of income to peoples' livelihoods (especially the poor and marginilized communities). The importance of this phenomenon of valuation of environmental goods and services is manifested in two ways. Firstly, it helps policymakers in designing and implementing effective poverty reduction strategies. Secondly, the size and nature of environmental values has implications for issues of conservation and sustainable resource use (Vedeld *et al.*, 2004; Willis, 2004).

It is estimated that 80% of the population of "developing" countries relies on NTFPs for their primary health and nutritional needs (FAO, 1995). In 1993, the world trade in NTFPs was estimated at US$ 11-billion. In addition to their economic value, NTFPs can play a vital role in restoration and maintenance of important cultural traditions and improve the quality of life for millions of people (Falconer, 1992; Craft *et al.,* 1997; Bishop, 1999; Harshaw, 2000; Dovie *et al.,* 2001; Chamberlain *et al.,* 1998; Hassan *et al.,* 2002). It is further generally assumed that the sustained extraction and processing of NTFPs by local people can enhance their cash income and provide an alternative to tropical deforestation (Hedge *et al.,* 1996). However, the degree to which such products may potentially contribute to rural incomes is poorly documented (Hedge *et al.,* 1996; Campbell *et al.,* 1997; High and Shackleton, 2000).

There is still no indication that the deforestation rate of natural forests and woodlands is decreasing (Crafter *et al.,* 1997; Gram, 2001). Destructive mining operations, non-sustainable logging and conversion of forestland to large-scale agriculture are the most economically favourable options for investment compared to such activities as sustainable extraction of NTFPs that have a great potential of natural forest preservation and environmental protection and conservation (Crafter *et al.,* 1997; Gram, 2001; Hassan *et al.,* 2002). The main attributes to that are: Firstly, several services provided by the forest, such as carbon dioxide storage conservation of biological diversity and maintenance of regional climate, represent externalities for companies investing in large-scale economic operations. Secondly, a wide range of products from natural forests and woodlands, rivers and lakes is extracted by adjacent communities and mainly used for subsistence purposes or exchanged at local markets; therefore, they are less attractive for commercial investments and non-local decision makers (Peters *et al.,* 1989; Godoy *et al.,* 1993, 2000; Temu, 1995; Robles-Diaz-De-Leon and Kangas, 1999; Gram, 2001; Hassan *et al.,* 2002)

Despite their widespread use and importance, NTFPs are generally considered as minor products and not included in regional or national forest planning strategies. For a long time NTFPs have been perceived as quaint substance products, that don't really add to the balance sheets of national economies, i.e. to the System of National Accounts (Godoy and Bawa, 1993; Crafter *et al.,* 1997; Harshaw, 2000; Dovie *et al.,* 2001; Hassan *et al.,* 2002: Clarke and Grundy, 2004).

Resource surveys and resource accounting for NTFPs in Swaziland is a relatively new field. A desk-top review of the NTFPs of Swaziland revealed an annual consumer value of selected NTFPs of between US$16.125 million and US$64.25 million with a median value of US$40.125 million at 1999 prices (DANCED, 2000b). Medicinal and pharmaceutical products and fuel wood were on the top two positions in this analysis. This value is conservative in respect of the other non-timber goods and services of the natural forests and woodlands of Swaziland, such as environmental protection. Natural resource accounts for the state and economic contribution of forest and woodland resources in Swaziland reveal that the contribution of natural forest and woodlands in flow benefits was equivalent to 2.2% of total GDP, 20% of agriculture GDP and 439% of the contribution of forestry reported in the formal national accounts for 2000 (Hassan *et al.,* 2002). This provides another evidence of the massive value of natural forest and woodland resources missing from the SNA in Swaziland.

The methods used to value tropical forests have the potential to influence how policy makers and others perceive forestland. Policy-makers and decision makers often assume that tropical and sub-tropical forests have no economic value, and through participatory natural resources and environmental accounting these people will change their attitudes (Peters *et al.,* 1989; Chopra, 1993; Campbell *et al.,* 1997; Shackleton and Shacketon, 2000; Dovie *et al.,* 2001; Hassan *et al.,* 2002).

5.1.1 Types of Value

The term value is used in many ways in studies on the economic valuation of NTFPs, including use values and non-use values (Harshaw, 2000). It is important to clarify the meanings of the different types of values, as the term can have distinct meanings. The working definitions and discussions of non-market values offered here were adopted from Bishop (1999), Sarker and McKenney (1992), McKenney and Sarker (1994) and Klemperer (1996).

Use values

Use value refers to the benefit a user obtains, either directly or indirectly, from participating in an activity. *Consumptive use* can be described as participation in activities that utilize and possibly deplete the forest resources (e.g. hunting, fishing and tree cutting); while *non-consumptive uses* are those uses or activities that do not affect the resource (e.g. bird-watching in a national park, appreciating a view at a look-out) (McKenney and Sarker, 1994).

Non-use values

Non-use values do not involve any actual physical consumption of the forest goods and services. Examples of non-use values include increases in productivity, well being, health, longevity, and feelings of peace and tranquility and a decrease in stress levels (Sarker and McKenney, 1992; McKenney and Sarker, 1994; Klemperer, 1996).

They are further classified as existence, option, quasi-option, bequest and vicarious values (Sarker and Mckenney, 1992; McKenney and Sarker, 1994). *Existence values* are those benefits that are derived from the knowledge that non-timber amenities and resources will continue to exist regardless of the fact that the amenity or the resource may never be used, seen or visited. *Option value* relates to the willingness to pay for an option to have the resources or services available in future when there is uncertainty attached to its supply (Bishop, 1999). In simple terms the option value has been defined as "the value of the opportunity for obtaining better information by delaying a decision that may cause irreversible changes" (Sarker and McKenney, 1992). *Quasi option* value is slightly complicated, it relates to the willingness to pay to avoid an irreversible development given an expectation that knowledge about the impact is in the offing (Bishop, 1999). *Bequest value* is the value assigned to preserving a resource for the use by future generations. In a forestry context, a bequest value could occur if an individual is willing and able to pay for the preservation of a forest resource so that his children and grandchildren find the resource in an intact state (McKenney and Sarker, 1994). *Vicarious value* deals with the value placed on a resource that may have never been used or planned to be used, but benefit may be derived from mere pictures, descriptions and other representations of the resource. Vicaroius values may include the information that certain rare species of animals like spotted owls, pine martens, peregrine falcons, etc. still exist. In addition to that in the case of a vicarious value there may be no motive other than mere knowledge of existence or preservation of a natural environment, and this makes vicarious values a variant of the existence value (McKenney and Sarker, 1994). A schematic representation of these values is presented in Figure 5.1.

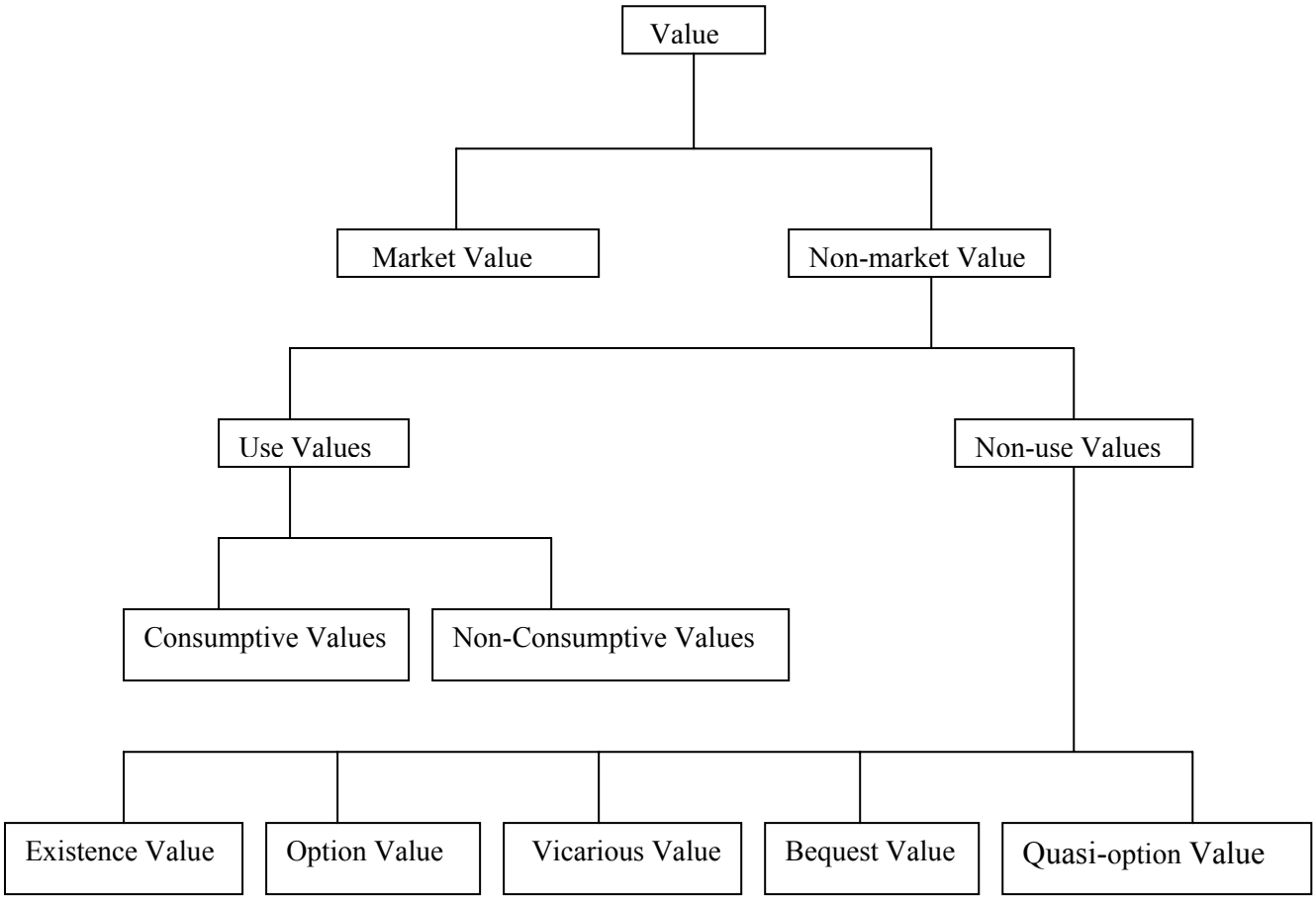

Figure 5.1 The relationship between different total economic values for NTFPs (*Source: adapted from Sarker and Mckenny, 1992, p. 6. While this figure classifies use value and consumptive value as non-market values, they may also be considered as market values).*

5.1.2 Valuation Methods

The methods adopted for the economic valuation of NTFPs generally include direct methods, which determine the value a person is willing to pay for the products or goods through a resource survey instrument. Indirect methods are also used to determine the value of NTFPs. A schematic representation of non-market valuation methods was developed by Sarker and McKenney (1992) and subsequently presented by McKenney and Sarker (1994) (Figure 5.2). Methods for valuing forests, adapted from Bishop (1999), are presented in Appendix 6.

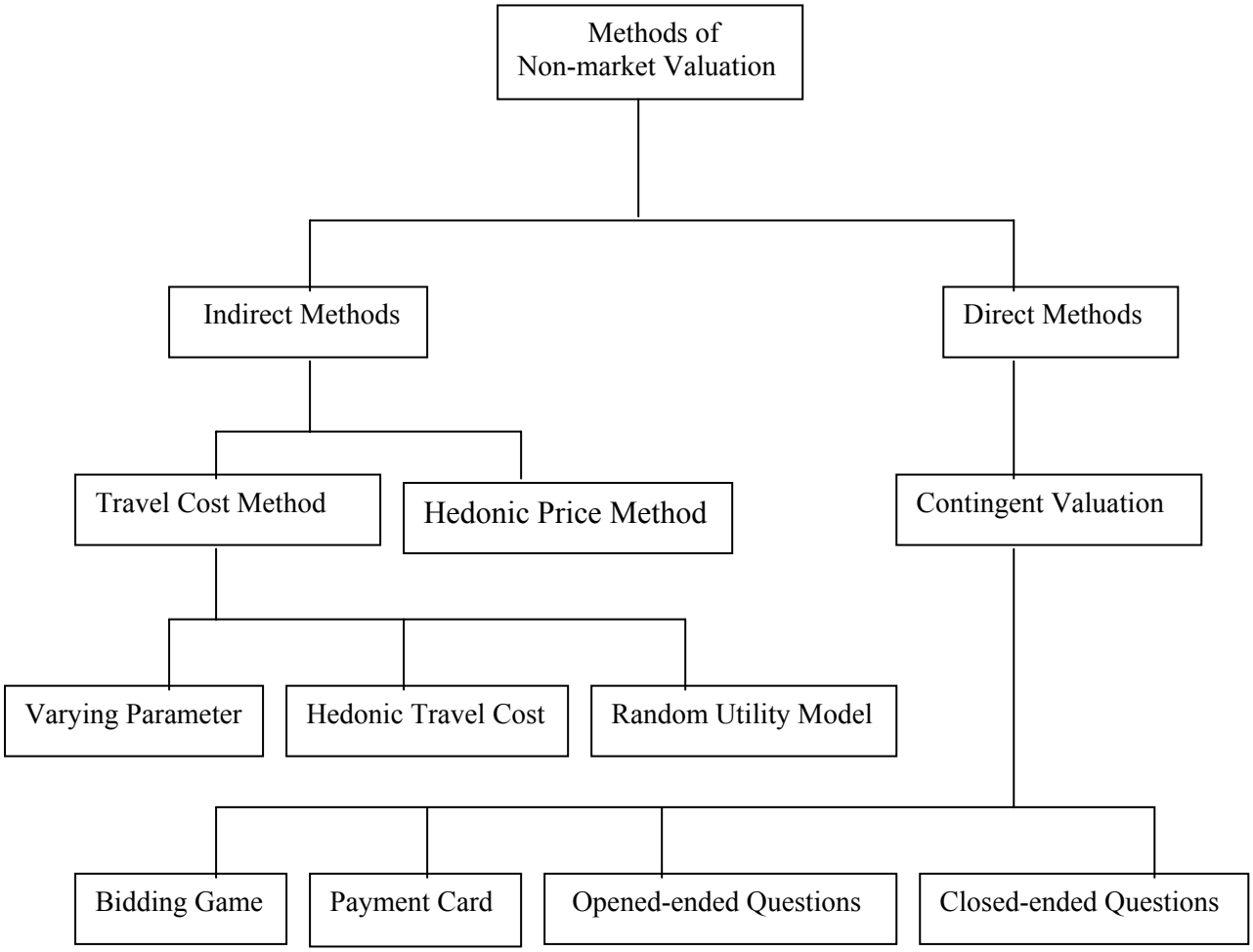

Figure 5.2 The relationship between different specific non-market valuation techniques for NTFPs
(*Source: adapted from Sarker and Mckenney, 1992)*

Indirect valuation techniques

The travel cost method is an indirect valuation technique that was designed to model recreation behaviour. This method calculates a value based on the fact that the price paid to travel to the site is the ultimate value of that site. It should be considered that no fees may be imposed on the use of the resource. The costs associated with travelling to the resource (fuel, mechanical maintenance of vehicle, time spent travelling there) become the variables to be used to determine the value of a resource. The weakness of this method is that it only deals with single destination trips and assumes that travel is a means, rather than an end in itself (Sarker and Mckenney, 1992; McKenney and Sarker, 1994; Klemperer, 1996; Bishop, 1999). Under the Travel Cost Method there are three methods: the Varying Parameter, the Hedonic

Travel Cost and the Random Utility Model methods. These variants of the travel cost method can be used to analyse the effect of the quality of the site characteristics rather than the gross value. They work with significantly more sophisticated econometric models than the basic travel cost method (Sarker and McKenney, 1992; McKenney and Sarker, 1994; Bishop, 1999). The origin of the travel cost methods is attributed to an economist named Harold Hotelling but its operational development and current popularity are due to work done by Clawson (1959), Knetsch (1963) and Clawson and Knetsch (1966). A detailed description of the Travel Cost Method and its subsidiaries is well articulated in Appendix 6.

The Hedonic price models are based on a hypothesis that goods are aggregations of characteristics and that the demand for these goods is interrelated to these characteristics (Sarker and Mckenney, 1992; McKenney and Sarker, 1994; Bishop, 1999). The characteristics are true arguments of utility functions and any transaction is tied to a group of characteristics, thus the demand for certain characteristics is embedded in the prices and consumption levels of market goods. A good example would be to consider that the price of a house in a city includes the contribution of a certain market goods (e.g., size, and design of the house, number of rooms, etc.) and the neighbourhood environmental conditions (e.g. air quality when near a sewage, noise pollution if near an air port, etc.) Overall hedonic price models is a means to quantify the contributions of the market and non-market aspects of a particular good to its equilibrium market price through sound statistical analysis (Sarker and Mckenney, 1992; McKenney and Sarker, 1994; Bishop, 1999). The hedonic price model was first used by Griliches (1971) and further developed and refined by Rosen (1974) and Palmquist (1991).

The household production function model involves situations where individuals purchase private inputs at market prices and combine them with their time and natural resources and environmental attributes to produce out-door recreation experiences. This model has two stages. Firstly, the household reduces the cost of producing a given level of experiences. Secondly, the recreationist maximizes their utility subject to their budget constraint to determine the level of recreation experiences to consume. The household production theory was developed by Becker (1965) and was subsequently refined to its present form by Muellbauer (1974).

Direct valuation techniques

Contingent valuation is a direct way of capturing consumer surplus by means of eliciting the willingness to pay value for the preservation of a resource or opportunity in a simulated

market. This method comprises a number of techniques to elicit valuation responses including a bidding game, the payment card, open-ended questions and close-ended questions (Sarker and Mckenney, 1992; McKenney and Sarker, 1994; Bishop, 1999; Harshaw, 2000). Another value that can be elicited through contingent valuation is a willingness to accept value. A willingness to accept provides an estimate of the amount of money an individual would like to be compensated for to forgo an opportunity. This value is estimated based on the fact that the payment is equal to the benefits that an individual would enjoy through salvaging that opportunity (Sarker and Mckenney, 1992, McKenney and Sarker, 1994; Bishop, 1999; Harshaw, 2000). In economic theory the willingness to pay and willingness to accept values are similar, but in reality it has been demonstrated beyond doubt that willingness to accept values can be four times higher than willingness to pay (Klemperer, 1996).

Experimental economics approach is another direct method of deriving un-priced values of environmental goods and services. High profile experiments can be put in place to elicit individuals' valuation for environmental amenities. However, conducting such meaningful experiments is generally difficult and expensive (McKenney and Sarker, 1994).

The current study focussed on farmgate prices which are more related to market prices than non-market values.

5.1.3 User Surveys and Economic Valuation

The ultimate aim of natural resource surveys and accounting is to promote sustainable use of the resources and prevent degradation (Hedge *et al.,* 1996; Dovie *et al.,* 2001; Sheil and Wunder, 2002; Geldenhuys, 2002). The economic valuation of NTFPs is faced with numerous challenges like the inventory of NTFPs. The underlying reasons for the difficulty in the valuation of NTFPs are attributed to the complex nature of the products leading to most having non-wood values. Non-wood values have been described as those goods and services produced by the forestland which enter an individual's preference (or utility) function and for which individuals are willing to sacrifice their scarce resources (McKenney and Sarker, 1994) and these products may not have a defined market price. The local factors that influence land-use priorities, such as lack of secure land tenure, the low level of price stability for NTFPs, the non-economic preferences, and the traditional taboos and norms regarding extraction of these products need to be integrated into the Economic Valuation (Gram, 2001). Present-day knowledge about the economic value of NTFPs is based on a doubtful foundation because the different methods used by scholars have led to different results. Consequently, widely different conclusions are made regarding the value of the various NTFPs (High and

Shackeleton, 2000; Dovie *et al.,* 2001; Gram, 2001; Godoy *et al.,* 2000; Sheil and Wunder, 2002). Godoy *et al.* (1993; in Wong *et al.,* 2001) presents a detailed summary of common failings of biometric rigour and reporting protocols in NWFPs assessments from the perspective of natural resource economists, and makes suggestions for how methods could be improved. Appendix 7 presents a summary of shortcomings of NWFPs resource assessments for valuation studies, and this is inconclusive as more and more scholars are coming up with more and more efficient resource assessment and valuations methods.

In spite of the available information (DANCED, 2000b; Hassan *et al.*, 2002), Swaziland still remains deficient of accurate and precise information on the economic value of the direct and indirect use benefits, and the intermediate use services of the non-timber forestry goods and services from the country's natural forests and woodlands (Braun and Dlamini, 1994; Dlamini, 1999; DANCED, 2000b; GOS, 2002a.

5.2 SPECIFIC OBJECTIVE

To undertake user surveys to determine the actual quantities of harvested and utilized edible and medicinal NTFPs, and to do an economic analysis of their direct use values.

5.2.1 Associated Research Question

- ✓ What is the socio-economic contribution of the harvested edible and medicinal NTFPs to the local people's health status, food security and rural household income?

5.2.2 Hypotheses to be tested

Hypothesis 4: The quantities and values of edible and medicinal NTFPs extracted and utilized vary amongst households in response to a myriad of local and external contextual conditions (Shackleton and Shackleton, 2004).

Hypothesis 5: Edible and medicinal NTFPs make a significant contribution to rural household income (Lawes et al., 2004; Chipeta and Kowero, 2004).

5.3 METHODS

5.3.1 Selection of the study area

The selection procedures for the study area, villages within each area and households within each village for user surveys were based on the following critirea:

Step One:

The study area covered the four ecological zones of the country in order to fully capture variability in climatic and socio-economic conditions between these regions of the country. In addition, a wide range of the country's major forest and woodland types would be captured. This would in turn allow for a broad spectrum of study sites to allow calculation of variance and make it possible to use the data for comparison and generalization (modified from Godoy *et al*., 1993; DANCED, 2000b; FAO, 2001; Hassan *et al*., 2002)

Step Two:

The selection procedure was such that all the villages selected within study sites were those that harvest, extract or collect and utilize NTFPs from the neighbouring natural forests and woodlands as suggested by Appasamy (1993), Godoy and Bawa (1993), Hall and Bawa (1993), Hedge *et a*l. (1996), Shackleton (1996), Campbell *et al*. (1997), Crafter *et al*. (1997), Qureshi and Kumar (1998), Shackleton and Shackleton (2000), Shackleton *et al*. (2002) and Dovie (2003b). Only rural villages were included in the study due to the low dependence of urban populations on direct harvesting of NTFPs from natural forests and woodlands (Hassan et al., 2002).

Step Three:

It was worthwhile to study at least two villages adjacent to a community forest reserve, where harvesting is monitored and under control. Over and above that it was important to have at least two villages surrounding a protection-worthy area, amongst those selected during a study on the identification of protection-worthy areas in Swaziland undertaken by DANCED (2000a). This was a means to assess the degree of product flow from a protection-worthy area to confirm its protection worthiness. Full details of the enumeration numbers of selected study areas and villages and the nominated natural forests and woodlands from which NTFPs are

harvested are presented in Table 5.1. The selection criteria for the villages are clearly outlined in steps one, two and three in section 5.3.1.1 above.

Table 5.1: An overview of the study sites-User surveys

Ecological zone	Area (site)	Adjacent Natural forests/woodlands	Village//Enumeration number
Highveld	Hhelehhele North	✓ Lufafa ✓ Epulazini ✓ Umshiyelangubo	✓ Mlumati/ 12104 ✓ Hhelehhele/12108
Middleveld	Grand Valley (KaKholwane)	✓ Umtfumunye ✓ Nkonono ✓ Endvosi ✓ Emgijaneni ✓ Batsakatsi ✓ Emoti	✓ Emoti/22249 ✓ Kundodemnyama/22250
Lubombo	KaShewula	✓ Shewula Nature Reserve ✓ Esiweni ✓ Egabaza ✓ Enkalashane ✓ Kufongo ✓ Etimbutini ✓ Emangoleni	✓ Jamehlungwini/44122 ✓ Mangwenya/44125
Lowveld	Siphofaneni	✓ Hlutse ✓ KaZakala ✓ Sigcaweni ✓ Othandweni ✓ KaJimba	✓ Hlutse/43138 ✓ Madvuma/43139

NB. The enumeration number is the number that depicts the locality of the study sites.

5.3.2 Household Profiles for the four sites across the four ecological zones

Within any given community there is significant socio-economic differentiation arising from a multitude of factors such as levels of employment, education, gender, age, human population, wealth status, farming opportunities, and other factors (Shackleton and Shackleton, 2005). A profile of the households at the site level was therefore carried out through face to face interviews and literature review at the Central Statistics Office. In all the areas, wealth status varied between households, and traders buy surplus goods at the farmgate. More details of the household profiles are given in Table 5.2. It should be noted that

this study classified households into ecological zones rather than household classes. The households withheld information on crop yields, sales, and mean cash income.

Table 5.2: A summary of household profiles in the various study sites

Factors	Highveld	Middleveld	Lubombo	Lowveld
Availability of wage employment	Migrant labour in towns	Migrant labour in towns	Available in the sugar industry, but seasonal	Available in the sugar industry, but seasonal
Crop farming	Maize, ground nuts, sweet potatoes, vegetables, paw-paw, banana, oranges, other.	Maize, water melons, pumpkins, ground nuts, potatoes, cassava, beans, other.	Cotton, maize, some legumes, other.	Maize, ground nuts, cassava, sorghum, sweet potatoes, other.
Livestock farming	6 goats, 7 cattle and 30 chickens.	11 goats, 8 cattle and 23 chickens.	9 goats, 8 cattle and 21 chickens.	8 goats, 7 cattle and 31 chickens.
Human population densities	7 people per household	7 people per household	10 people per household	7 people per household
Age profiles	20 to 60 years	20 to 74 years	19 to 68 years	25 to 72 years
Gender profiles	60% women	50% women	55% women	55% women
Availability of food aid	Not reliable	Not reliable	Reliable	Not reliable
Availability and proximity to health care centres	Easy access	Access difficult due to long distances	Access difficult due to long distances	Easy access

5.4 DATA COLLECTION AND ANALYSIS

5.4.1 Step One: Literature search

Existing relevant documents, from the Central Statistics Office (CSO) on the latest census on the number of homesteads and average individuals per household on study sites, were reviewed. This aided in determining the sample size (number of households to be selected for interviews per village for precision purposes).

5.4.2 Step Two: Community Meetings

Three community consultation meetings were held to brief the people about the relevance of the user surveys and economic analysis of the actual harvested quantities of their preferred medicinal and edible products to the resources inventory and sustainability of NTFPs. The full cooperation of the people was sought following the same trend like during the National Forest Policy development process in 2001/2002 and a slight modification of the work of Balick and Mendelson (1992), Hall and Bawa (1993), Peters (1996), Campbell *et al.* (1997) and Gram (2001).

Recorders and assistant recorders were chosen and subsequently trained over a two-day session on data recording in the field and at household level. These recorders were required to go to the field to monitor resource consumption at least twice a week, for the entire survey period of seven months, while also doing daily records of household use of resources. They were assessed during the first two weeks of the survey and monitored by the technical team unannounced every fortnight to improve the efficiency and reliability in data collection and recording.

There were 5 recorders from the local community in each study site (each recorder was assigned 7 households). There was one technical assistant (the regional forester) in each site with the project leader (myself) covering all study sites.

5.4.3 Step Three: Sampling Design and Procedure

According to recent studies (Godoy *et al.,* 1993, 2000; Wong *et al.,* 2001) the most accurate method of valuing NTFPs extracted is to identify, count, weigh and measure them as they enter the village daily. This study, in addition to the above method, also investigated the quantities of products harvested and consumed or traded either in the forest or along the way to the village but before the collectors enter the village. This is in view of the fact that a variety of products, especially edible ones, are consumed by villagers daily before reaching the village while doing other tasks, for example, herding cattle (boys and men), extracting building material (boys and men), and collecting fuel wood or thatching grass (women and girls). Men are fond of roasting small mammals during hunting expeditions and trading traditional liquor in the forest (e.g. *Phoenix reclinata* cider that is usually traded and consumed in the forest in Swaziland).

The sampling approach omitted any on-farm harvesting of NTFPs and concentrated on those NTFPs collected from natural forests, other wooded land and trees outside forests. This means that the values per household per year of edible and medicinal NTFPs calculated will be conservative considering the results in High and Shackleton (2000) where NTFPs made one third of the total value from home plots or home gardens.

A Nested Sampling approach was followed, where villages are nested on sites and in turn households are nested in villages (modified from Ott, 1998). Two villages adjacent to the study sites were selected based on the criterion that they do harvest edible and medicinal NTFPs either for domestic or sale purposes on a full time basis. A maximum of seventeen

households per village were selected in line with criteria outlined in section 5.3.1 (modified from Campbell *et al.,* 1997; Gram, 2001; Hassan *et al.,* 2002; Shackleton *et al.,* 2002).

5.4.4 Step Four: Employment status of selected households

A brief analysis of the employment status of all the selected households in all the study sites was carried out through interviewing households for the number of employed versus unemployed members. This was to have an idea of the financial status of the households besides subsistence farming and its effects on NTFPs harvesting.

5.4.5 Step Five: Data Recording

Special recording sheets were printed for each household (maximum of thirty four) per study site (modified from Godoy *et al.,* 1993; Gram, 2001; Wong *et al.,* 2001; Hassan *et al.,* 2002; Shackeleton *et al.,* 2002) to collect and record the following data, where possible (see Appendix 11 for the data recording sheet):

1. Which specific products are extracted/collected/harvested?
2. Where are they collected (e.g. on trees, shrubs, herbs, under-story, on the ground, water courses, etc.);
3. Who collects the products (men, women, children etc.);
4. Quantities of products extracted (for consumption in forest/veld/along the way home);
5. Quantities of products collected for domestic use; quantities of products harvested for trade (bartering or sale);
6. Time spent going to the source/forest;
7. Time spent extracting product;
8. Distance between homestead and product source (km);
9. Processing and end-use of products; value of products (preferably at farmgate);
10. Tools for extraction;
11. Transport means to convey products to the village;
12. Marginal costs of extraction (in terms of time, labour, processing etc.);
13. Farming activities (yields and economic value);
14. Other income; and time used in different activities; and
15. Farmgate prices were being collected monthly over the entire survey period from local sources.

Based on the above data the annual direct use values per household were calculated. The user surveys were undertaken from November 2003 up to July 2004.

5.4.6 Step Six: Economic Valuation

Below is a generally ideal equation for calculating the value of NTFPs, under sustainable and unsustainable extraction (Godoy *et al.,* 1993, 2000):

The following equation would be the most ideal method to calculate the Value of NTFPs under sustainable extraction:

$$\sum_{i-0}^{n} Qi(Pi - Ci)$$

Where:

Qi = quantity of goods extracted

Pi = forest/farm gate price of the goods

Ci = cost of extraction (marginal costs of extraction)

i = set of non-timber forest products

If the extraction rates are non-sustainable, adjustment should be made for the eventual depletion of the products by adding to *Ci*, a depletion premium based on the expected date of extraction (Godoy *et al.,* 1993, 2000).

However, the above equation was found to be inappropriate for calculating value of NTFPs extracted per household in rural Swaziland due to the following factors:

1. Extraction costs are largely very low, as none of the resources harvested require specialist tools, usually just an axe, sickle or a bushknife and such tools are used for a multitude of uses within the household. Transport used for conveying edible and medicinal NTFPs was mainly 'walking'. Thus, once the capital cost is spread over a number of different uses and then subject to a discount factor over the life of such a tool, then the annual cost or cost per unit harvested is negligible (Shackleton and Shackleton, 2000). Furthermore, the collecting containers for the NTFPs were old sacks and used plastic bags.

2. The impact of opportunity cost of labour were also very small, firstly because the daily rates paid for labour collecting NTFPs does not exist within the rural areas, as these products are collected by women and children as well as unemployed men, and there is a large surplus

of unskilled labour. So the application of opportunity cost of labour under such circumstances would be unrealistic (Shackleton and Shackleton, 2000).

Then the approach of Shackleton and Shackleton (2000) and Shackleton *et al.* (2002) was modified and adopted where the following equation is fitted:

Annual Value extracted per household =Annual Quantity Extracted (either for domestic use or trade) x Mean Farmgate Price

5.4.7 Step Seven: Data Analysis

The data sets collected for household profiles, annual quantities of edible and medicinal NTFPs harvested per household, and the annual value per household for harvested NTFPs were analysed and results were interpreted. Analyses were carried out at the following levels:

1 Between Sites
2 Between Villages within Sites
3 Between Households within Villages
4 Between Species within Sites
5 Between Species within Villages

Statistical Analyses

This was not an experimental study, but a nested sampling design and procedure with continuous data. Therefore appropriate analyses of variance (Proc GLM with SAS version 8.2) were used to analyse the data (SAS, 1999). Student's t-Least Significant Difference was calculated at the 5% confidence level to compare treatment means (Ott, 1998).

The Statistical model: Household Profiles

$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$

Where:
μ =population mean
α_i =main effect (Employment)
ε_{ij} = error

(Analysis of variance for a one-way classification)

The Statistical model: Annual Quantities and Values

$Y_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \varepsilon_{ijk}$

Where:
μ =Population mean
α_i = main effect (site or species or village)
β_j = duration effect
$\alpha\beta_{ij}$ = interaction effect of duration with main effect (site or species or community)
ε_{ij} = error

The Shapiro-Wilk test was performed to test for non-normality (Shapiro and Wilk, 1965). In some cases where evidence of non-normality was found, it was due to high kurtosis and not skewness. A magnitude of similar values was responsible for the kurtosis. According to Glass *et al.* (1972) these analyses are valid.

5.5 RESULTS

5.5.1Employment Status of households

The data for employment status of households were log transformed during statistical analysis, hence the means look a bit unrealistic but the trend is correct for interpretation purposes. The village with the highest employment (as reflected in the raw data) remains as such and vice versa. There were highly significant differences ($p<0.0001$) in the number of unemployed members per household between sites Table 5.3). The t-test (LSD) shows that Grand Valley had the highest mean and Shewula had the lowest mean, this means that more members per household are unemployed in the Grand Valley and a few members are unemployed in the Shewula site. There were no significant differences in the number of employed members per household between villages ($p=0.7208$).

An additional column to show the number of members per household would be most appropriate to compare with the means of employed or unemployed members per household. However, under the circumstances since the data was transformed for it to be fit for analysis the means make not relate well with the exact number of members per household, as a result the number of members per household is omitted in Table 5.3.

Table 5.3: The mean number of unemployed members per household in the different sites and villages in Swaziland

Members Unemployed per household			
Level of Site	**Number of households studied**	**Mean number of unemployed members per household**	**SD**
Grand Valley	34	4.3667 (a)	1.7263
Hhelehhele North	34	4.1703 (ab)	1.8187
Siphofaneni	34	3.5520 (b)	1.9266
Shewula	34	1.9796 (c)	1.0420
Members Unemployed per household			
Level of Village	**Number of households**	**Mean**	**SD**
Hhelehhele North	17	4.3963	1.7028
Kundodemnyama	17	4.3673	1.7447
Emoti	17	4.3661	1.7613
Mlumati	17	3.9443	1.9529
Madvuma	17	3.8417	1.8143
Hlutse	17	3.2624	2.0458
Mangwenya	17	2.1727	1.3583
Jamehlungwini	17	1.7865	0.5728

5.5.2 Edible and medicinal species used

There was variation in the number of NTFPs (edible and medicinal) species reported per household, per village and per ecological zone (study site), and in the harvesting periods between villages (Table 5.4).

Table 5.4: Edible and medicinal NTFPs species used and harvesting duration according to the user surveys undertaken in the eight villages over the four ecological zones

Village	No. of edible species	Harvesting duration (weeks)	No. of medicinal species	Harvesting duration (months)
Mlumati	12	3 durations (8, 12, 16)	12	5 durations (1, 2, 3, 4, 5)
Hhelehhele North	12	3 durations (8, 12, 16)	13	5 durations (1, 2, 3, 4, 5)
Emoti	25	4 durations (8, 12, 16, 20)	20	5 durations (1, 2, 3, 4, 5)
Kundodemnyama	28	6 durations (4, 8, 12, 16, 20, 24)	38	5 durations (1, 2, 3, 4, 5)
Jamehlungwini	12	4 durations (4, 8, 12, 16)	17	3 durations (1, 2, 3)
Mangwenya	9	3 durations (4, 8, 12)	11	5 durations (1, 2, 3, 4, 5)
Hlutse	26	5 durations (4, 8, 12, 16, 20)	5	5 durations (1, 2, 3, 4, 5)
Madvuma	20	2 durations (8, 20)	3	8 durations (1, 2, 3, 4, 5, 6, 7, 8)

5.5.3 Annual quantities and values harvested per household

The summary statistics for the mean quantities and values per year of edible and medicinal goods harvested per household in the four study areas show large variations (Table 5.5).

Table 5.5: Summary statistics of mean annual quantities and mean annual values per household in the various study sites

Item	Hhelehhele North		Grand Valley		Shewula		Siphofaneni	
Annual Quantities	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)
Edible	193	115.8b	239	410.4b	96	166.4b	217	2144.9a
Medicinal	99	2.8b	148	5.3a	103	1.6c	102	1.6c
Annual Values	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)
Edible	193	53.9b	239	534.0ab	96	80.9b	217	995.6a
Medicinal	99	65.6b	148	122.1 a	103	37.0c	102	37.4c

Means with same letters are not statistically significantly different, Exchange rate: 1US$ is equivalent to R6.50 as at 2004 (Times of Swaziland, 2nd March 2004).

The statistical significance of the quantities harvested, the duration of the harvests and the interaction between the quantities and duration are shown in Table 5.6. The annual quantities

harvested per household in edible NTFPs are significantly different between the study sites. However, the differences between harvesting duration and in interaction between sites and duration are not significant. Furthermore, the differences in annual quantities of harvested medicinal NTFPs between sites are highly significant. The differences between sites in annual value per household are not significant for edible NTFPs, but are highly significant for medicinal NTFPs. These results support, in part, the hypothesis that there are variations in quantities of NTFPs harvested between sites.

Table 5.6: Combined ANOVA for User Surveys and Economic valuation in the various study sites

Item	Source of Variation	Degrees of freedom	Mean Squares	P-Values
Annual Quantities-Edibles				
	Sites	3	185860789.8	0.0038
	Duration	5	24691899.2	0.7001
	Sites*Duration	9	6822327.8	0.9972
Annual Quantities-Medicinal				
	Sites	3	390.33	<0.0001
	Duration	8	605.50	<0.0001
	Sites*Duration	12	275.81	<0.0001
Annual Values-Edibles				
	Sites	3	1530642900	0.013
	Duration	5	471179970	0.359
	Sites*Duration	9	83164253	0.990
Annual Values-Medicinal				
	Sites	3	8790066.3	<0.0001
	Duration	8	13624913.6	<0.0001
	Sites*Duration	12	6205148.8	<0.0001

The findings of the study show that there are significant differences between villages within sites in the annual quantities harvested per household in edible NTFPs in all the various study sites. However, for Hhelehhele North and Shewula there are significant differences in annual quantities harvested per household over harvesting durations. The annual quantities harvested per household for medicinal NTFPs show significant differences between villages within sites, except for Hhelehhele North. The same applies for harvesting duration.

The study has shown that there is a very high extraction rate of edible NTFPs at Siphofaneni area (Table 5.5). This means that households surrounding/adjacent to the natural woodlands in the area make good use of the available wild edible NTFPs. The Grand Valley area

harvests the highest quantities of medicinal NTFPs. This means that communities in the area rely heavily on the available natural medicines in the surrounding woodlands.

Similarly, there are significant differences in annual values per household between villages within sites in both edible and medicinal NTFPs (Table 5.7). The same trend as in high extraction rates (see previous paragraph) is seen in annual values, most probably because prices are constant across the study sites.

As mentioned before there were 6 classes of harvesting duration (in weeks) for edible NTFPs and 9 classes for harvesting duration (in months) for medicinal NTFPs (Table 5.8). The highest extraction rate of edible NTFPs occurred over 8 weeks, while the highest for medicinal NTFPs was over 5 months. It was alluded to that there are species that are harvested any time of the year (for medicine), but it should be noted that these are not harvested continuously but fall within the given harvesting durations as well. The annual values for both edible and medicinal NTFPs followed the trend of the annual values since unit prices were constant.

The study further gave details of individual villages in quantities and values per household for the user surveys (Table 5.9). The Madvuma and Hlutse villages under the Siphofaneni are the highest in harvested quantities of edible NTFPs. This is in line with the above results where Siphofaneni site was highest in edible NTFPs. This could be the main reason why the new national project on the harvesting and processing of indigenous edible forest products is based in the Siphofaneni area. The Hhelehhele and Mlumati villages in the Hhehhele North area were the lowest. The Emoti and Kundodemnyama villages in the Grand Valley area were highest in harvesting medicinal NTFPs, and this agrees with the earlier report that the Grand valley site was highest in medicinal NTFPs extraction. The annual values followed the same trend.

Out of interest the twenty most harvested species of edible and medicinal NTFPs were selected based on harvesting frequency and quantities over the entire spectrum of the study sites (Table 5.10). *Sclerocarya birrea* was the most highly ranked species in the user surveys. The matrix of common NTFPs in Swaziland in Chapter 3 also revealed that *Sclerocarya birrea* was the most multi-purpose species in Swaziland. Currently there is a national project initiative on the collection and processing of indigenous fruit and berries, where *Sclerocarya birrea* is the top priority species.

Table 5.7: Combined ANOVA for User Surveys and Economic valuation in the various study sites

Sources of Variation	Hhelehhele North			Shewula			Siphofaneni			Grand Valley		
	Degrees of Freedom	Mean Squares	P-Values	Degrees of Freedom	Mean Squares	P-Values	Degrees of Freedom	Mean Squares	P-Values	Degrees of Freedom	Mean Squares	P-Values
Annual Quantities-Edibles												
Villages	1	94730.9	0.1700	1	28894.3	0.480	1	258316451.0	0.17	1	684210.17	0.450
Duration	2	2144800.4	<0.0001	3	323794.0	0.001	4	34293499.1	0.91	5	4051463.00	0.006
Villages*Duration	2	234789.0	0.0107	2	5393.5	0.910	1	42035186.6	0.58	3	149628.2	0.940
Annual Quantities-Medicinal												
Villages	1	0.2	0.873	1	44.8	0.005	1	12.7	<0.0001	1	551.9	<0.0001
Duration	4	18.2	0.070	4	24.8	0.002	8	10.0	<0.0001	4	1827.9	<0.0001
Villages*Duration	4	4.3	0.720	2	7.6	0.250	3	2.8	<0.0001	4	0.4	0.9600
Annual Values-Edibles												
Villages	1	773063.4	0.1900	1	126015.6	0.6200	1	2266113258.0	0.18	1	92592333.0	0.49
Duration	2	19242477.0	<0.0001	3	3583099.9	0.0003	4	296495866.0	0.91	5	332963035.0	0.13
Villages*Duration	2	2150924.0	0.0100	2	34227.3	0.9300	1	411554257.0	0.56	3	19389420.0	0.90
Annual Values-Medicinal												
Villages	1	4794.8	0.80	1	1000125.6	0.005	1	286166.7	<0.0001	1	12418691.4	<0.0001
Duration	4	410911.4	0.07	4	559886.7	0.002	8	225475.0	<0.0001	4	41127667.2	<0.0001
Villages*Duration	4	97929.7	0.72	2	172095.1	0.250	3	65117.5	<0.0001	4	9768.3	0.9600

Table 5.8: Summary Statistics of mean annual quantities and mean annual values per household over the respective harvesting durations

Harvesting duration in weeks-Edibles	Annual Quantities		Annual Values	
	N	Mean (kg)	N	Mean (US$)
4	29	15.9	29	7.4
8	256	1804.3	256	834.8
12	255	106.9	255	54.3
16	157	644.9	157	808.1
20	45	239.3	45	155.3
24	3	64.0	3	78.8
Harvesting duration in months-Medicinal	Annual Quantities		Annual Values	
	N	Mean (kg)	N	Mean (US$)
1	133	0.9	133	22.3
2	116	1.5	116	36.3
3	99	2.3	99	54
4	63	7.4	63	171.4
5	23	14.1	23	325.8
6	10	3.0	10	69.2
7	4	3.0	4	70.7
8	1	4.0	1	93.2
9	3	4.0	3	103.8

Exchange rate: 1US$ is equivalent to R6.50 as at 2004 (Times of Swaziland, 2nd March2004).

Table 5.9: Summary statistics of mean annual quantities and mean annual values per household in the respective villages

Item	Madvuma		Hlutse		Kundodemnyama		Emoti		Mangwenya		Jamehlungwini		Hhelehhele North		Mlumati	
Quantities	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)	N	Mean (kg)
Edibles	122	3107.6a	95	908.4b	112	467.4b	127	360.1b	37	188.3b	59	152.7b	96	138.0b	97	93.7b
Medicinal	49	1.9de	53	1.2ef	84	3.6b	64	7.5a	56	2.2cd	47	0.8f	50	2.7c	49	2.8bc
Values	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)	N	Mean (US$)
Edibles	122	1434.3a	95	432.2b	112	636ab	127	444.1ab	37	87.9b	59	76.5b	96	63.7b	97	44.3b
Medicinal	49	45.9de	53	29.6ef	84	83.2b	64	173.2a	56	50.8cd	47	20.4f	50	64.5c	49	66.7bc

Means with same letters are not statistically significant or different, Exchange rate: 1US$ is equivalent to R6.50 as at 2004 (Times of Swaziland, 2nd March 2004)

Table 5.10: The top twenty most commonly harvested species across the study sites

Species/product name	Mean Annual Quantities harvested (kg)
Edibles	
Sclerocarya birrea	755
Strychnos spinosa	204
Strychnos madagascariensis	186
Aloe saponaria	180
Caterpillars	180
Psidium guajava	170
Umbhindolo (SiSwati name)	160
Pollichia campestris	128
Syzygium cordatum	124
Englerophytum natalense	123
Medicinal	
Aloe saponaria	24.6
Momordica onvolucrata	12.0
Momordica claematidia	12.0
Tubernaemontana elegans	8.5
Schotia brachypetala	7.6
Kigelia africana	6.5
Siphonochilus aethopicus	5.6
Pittosporum viridiflorum	3.5
Rotheca hirsuta	3.4
Peltophorum africanum	2.9
The prioritised multi-purpose species harvested for both edible and medicinal purposes	
Sclerocarya birrea	
Psidium guajava	
Momordica involucrate	
Momordica clematidea	
Aloe saponaria	
Berchemia zeyheri	

5.6 DISCUSSION

The results of this study confirm that natural forests and woodlands contribute to all aspects of rural life, in particular by providing foods and medicines to the rural communities. There is, however a great variation within and between sites and within and between communities, as noted, in the annual quantities harvested per household per year and the annual value per household per year derived from various forest foods and medicines. These results are in line with the findings of Falconer (1992), Shackleton *et al*. (2002), and Hassan *et al*. (2002). The Emoti and Kundodemnyama villages reported the highest number of harvested and consumed edible species (25 and 28), followed by the Hlutse and Magwenya villages (26 and 20). According to the Hess *et al*. (1990) and DANCED (1999) forest inventories, these villages fall under the mixed woodland and acacia savanna zones, which have the highest number of plant species recorded.

Forest foods still contribute significantly to the diet of many rural households. All households studied consume wild edible plants and plant products on a seasonal basis. The results show that most forest foods are mainly harvested in spring and summer (the reaserch was carried out during this time of the year when forest foods are collected in the rural areas), which in the case of rural Swaziland are periods of critical food shortages since most of the field crops are only available at the end of summer. Predominant forest foods include wild edible leaves, fruits and berries as indicated by Falconer (1992), Shackleton *et al*. (2002), and Hassan *et al*. (2002). This study indicated that all households in all communities sampled, harvest and consume wild edible NTFPs and similar results were found in South Africa (Shackleton and Shackleton, 1997). The harvesting season is mainly between December and April, and this tallies with findings of Shackleton and Shackleton (1997). This study found that there is a total of 57 species eaten and each household consumed between 5 and 15 species (Appendix 8), while a similar study in South Africa showed that all households sampled consume between 6 and 10 species with 100% of the households consuming wild edible fruits, and a total of more than 50 species were eaten (Shackleton and Shackleton, 1997). Indigenous edible plants and animals are widely used in most parts of eastern and southern Africa (Crafter *et al.*, 1997). In addition to NTFPs, rural inhabitants make considerable use of wild resources from communal areas around settlements, including fallow lands and residential plots (Ogle, 1982; High and Shackleton, 2000). These resources include wild edible leaves, berries, and other edible portions that supplement the diet of the rural people.

In terms of traditional medicines this study shows about 65 harvested species of forest medicines over the eight villages sampled (Appendix 8), while in South Africa 120 species

were reported by traders and healers in Mpumalanga Province alone (Mander, 1997). The differences in figures could be attributed to the fact that this study was concerned with the general public and not specific to traditional healers and traders. Traditional practitioners may list more species.

The villages or communities from the Grand Valley and Siphofaneni sites consumed more forest foods and medicines. This may be attributed to the high rate of unemployment that leads to people spending more time foraging and more time in harvesting and extracting forestry resources for their livelihoods. Communities from Hhelehhele North and Shewula sites are engaged in extensive agriculture and the climate is highly favourable and as such they spend less time foraging and more time in non-forestry occupations and use more agricultural and industrial products. The other reason why Shewula site extracts fewer wild products may be the reliable National Food Aid Programme in the area that provided people with alternative sources of food, which is rare in the other study sites. Similar results were found in Zimbabwe (Campbell, 1987).

Wild edible and medicinal plants account for a larger share of household income among households with unemployed members in the communities from Grand valley and Siphofaneni sites than among households with employed members from the Hhelehhele North and Shewula sites.

The study shows that natural forests and woodlands remain a highly valued source of natural medicines, which are essential components of health treatments throughout Swaziland. They are the main medicines used by the vast majority of rural people (except in the Siphofaneni site) and despite many different healing practices and beliefs; they are still commonly used in conjunction with mystical and ritual practices and beliefs.

The possible factor that makes the Siphofaneni people to harvest few medicinal plants could be the availability of many and easily accessible health care centres in the area, which is not the case with the other study sites. In addition, the Siphofaneni site is close to a small town and the people normally prefer modern medicines to traditional medicines.

The survey found that knowledge and use of plant medicines is not confined to specialist healers but the local people practice self-administered treatments. Elderly women and men play a vital part in first aid treatments as they normally diagnose and treat the health related problems of their family members. Knowledge of plant medicine treatments is passed on from generation to generation, and even young children have some knowledge in plant medicine

treatments. Similar facts were established in southern Ghana (Falconer, 1992). A medicinal plant survey in South Africa indicated that traditional medicine consumers come from across the age spectrum and tribal groups and include both sexes (Mander, 1997). Over and above that, some 58% of clinic patients indicated that they use both indigenous and conventional health care systems. They further indicated that 67% of plants used were obtained from traditional healers while 30% were collected from the veld and only 3% were purchased, thus confirming that self-medication takes place within the traditional healing system.

Generally the people use a wide range and combination of different health options depending on their particular ailment, financial situation, past experiences and access to and availability of conventional medicines or traditional healers. This is reflected in the variation in annual quantities harvested per household and annual values per household between households within villages studied. All households interviewed in all the eight villages use plant medicines, and the majority of them rely on wild plants as their main medicinal source. Dlamini (1999) notes that traditional healers play a very important role in the health sector in Swaziland. The number of healers to the population is given as 1:100 indicating as many as 10 000 traditional healers in the country. Many medicinal plant families provide ingredients for traditional treatments (roots, stems, leaves, flowers, tubers and rhizomes are used) and are found in market stalls. Indigenous medicinal plants are widely used in most parts of eastern and Southern Africa (Crafter *et al.*, 1997).

The top ten most preferred indigenous edible species that are harvested in large quantities, include the caterpillars- *Imbrasia belina* and mushrooms, and the follwing fruits: *Sclerocarya birrea, Strychnos spinosa*, *Strychnos madagascariensis*, *Aloe saponaria*, *Psidium guajava,Umbhindolo, Pollichia campestris, Syzygium cordatum and Englerophytum natalense*. All these species have a vibrant local and national market all over the country. That means that they are of high commercial value and thus preferred by collectors for household cash income. Most of the plant species listed above are multi-purpose as they are also medicinal. This list differs slightly from the priority list of candidate edible trees for immediate domestication developed by the Swaziland National Tree Seed Centre (Dlamini, 1998). The main reason could be that the SNTSC did not consult the communities while developing their list, but relied on existing literature and other regional priority lists.

The top ten predominant indigenous medicinal species that are most preferred and harvested more frequently are: *Aloe saponaria*, *Momordica involucrata*, *Momordica clematidea*, *Tabernaemontana elegans*, *Schotia brachypetala*, *Kigelia africana*, *Siphonochilus aethiopicus*, *Pittosporum viridiflorum*, *Rotheca hirsuta* and *Peltophorum africanum*. This list

of species is similar to that of Dlamini (2000) but differs from that compiled for the natural resource accounts for the state and economic contribution of forests and woodland resources in Swaziland by Hassan *et al*. (2002).

The indigenous and naturalized species that are harvested for both food and medicine are: *Sclerocarya birrea, Psidium guajava, Momordica involucrata, Momordica clematidea, Aloe saponaria, Berchemia zeyheri.* As a result these multi-purpose species are the most highly valued plant species in all the villages where they exist. The notable thing is that these species are almost always readily available within short distances from the village. Furthermore, *Sclerocarya birrea* occurs in all the eight villages sampled, but due to altitude it is relatively scarce or sparsely distributed in the Highveld region of the country.

The most valuable indigenous edible species listed is almost the same as the most preferred, excluding Umbhindolo and *Syzygium cordatum* and the inclusion of Bee honey and *Sarcostemma viminale*. The farm gate price of bee honey is slightly higher at US$3.10 per kg. The prices of the other species are almost the same at an average of US$0.46/kg. The variation in the rankings for annual values may be attributed to the fact that the annual harvested quantities and actual farm gate prices of the species differ between and within villages. The ten most valuable medicinal species are exactly the same species as those most preferred and most harvested species above. This is logical considering that the farm gate prices of medicinal products are at an average of US$23.10 and the prices only change, but drastically, when the products reach the town markets after some value adding processing. This processing could involve grinding, drying, sorting, etc., to produce semi or finished products. The farm gate prices of edible NTFPs ranged from US$0.46 per kg to US$3.10 per kg, while those of medicinal products ranged between US$15.40 per kg to US$23.10 per kg. These prices are expected to rise at the urban markets and also vary from species to species depending on the price elasticity of demand and supply. This means that the indicated values of the preferred edible and medicinal NTFPs reflected in this study are conservative figures on the lower estimate. These prices are however in line with those in Mander (1997) and DANCED (2000b) except that the prices of indigenous vegetables have risen over the last four years from US$0.77 to US$3.10 per kg while the prices of indigenous edible fruits and berries have not changed much since then. The steady increase in the demand for indigenous vegetables for health reasons may be responsible for the hike in their prices.

The annual values per household for edible NTFPs ranged between US$44.3 and US$1434.3, while the annual values per household in medicinal NTFPs ranged between US$20.4 and US$173.2. These figures are higher than the mean gross direct use value for utilization of

plant resources of US$159 in the Eastern Cape Province of South Africa reported by Cocks and Wiersum (2003). These figures are higher than those of Shackleton *et al*. (2002) of a mean total gross annual direct use value per household of between US$211 and US$324 found in Kat River Valley of South Africa. These figures are extremely high in view of the fact that this study only covered edible and medicinal products and excluded other NTFPs such as fuelwood and bushmeat, which the South African study included. The range in this study is higher than a combination of wild and domestic plants that were valued at US$206.00 per household per year in a South African rural village by High and Shackleton (2000), considering that this study excluded domestic plants. The annual values per household in this study are higher than those of the annual value of woodland resources (mainly NTFPs), in all sectors in South Africa, of an annual value of US$193 and US$41 per household for edibles and medicines, respectively (Dovie *et al*., 2001). The annual values in this study are comparable with those total direct use values of 11 secondary resources in the Bushbuckridge area in the Lowveld of South Africa where US$368 per household is for domestic use and US$767 is for trading (Shackleton and Shackleton, 2000).

Based on the resource assessment and economic analysis of preferred NTFPs and other wild resources from communal lands, Shackleton (1996), in the Central Transvaal of South Africa, noted that the broad-scale harvesting and commercialisation of such natural resources in such areas could be a vehicle towards meaningful development, rather than to simply support a subsistence livelihood. The same could be said about Swaziland in view of the economic values of the preferred NTFPs in the four ecological zones.

The ultimate concern of the user surveys is ecological rather than economic sustainability. This is in consideration of the fact that extraction of NTFPs may be economically sustainable if the value, adjusted for inflation, increases or remains constant, but economic sustainability is not always consistent with ecological sustainability (Hall and Bawa, 1993). In this case over-harvesting of the preferred NTFPs may lead to continuing decline of populations while persistent demand keeps the market value constant.

The populations of the highly sought species of forest foods and forest medicines become depleted and the products become scarce, and there may be an increase in economic return if the demand remains the same while the resources are dwindling. Furthermore, scarcity may increase the marginal costs of extraction, pushing the prices upwards thus reducing the demand.

Consequently, with complete resource depletion, there will be neither economic nor ecological sustainability, but only local extinction of the economically viable species. In economic terms, the effects of unsustainable extraction take a long time to be detected, especially with long-lived trees (Hall and Bawa, 1993).

5.7 CONCLUSIONS AND RECOMMENDATIONS

The study has shown that the rural communities of the four ecological zones of rural Swaziland make good use of the NTFPs from the surrounding natural forests and woodlands, and that the financial value of such direct provisioning was significant. In addition, the input costs associated with harvesting of natural resources were extremely low, making it a viable strategy for poor households, both for domestic consumption and trade. It is worth noting that about 75% of the entire population resides in the rural areas where poverty is very high and the vast majority of these people depend on and derive many direct and indirect use and non-use benefits from natural forests and woodland resources (DANCED, 2000b; GOS, 2001a; Hassan *et al.*, 2002).

Hypotheses 4 (The quantities and values of edible and medicinal NTFPs extracted and utilized vary amongst households) and 5 (Edible and medicinal NTFPs make a significant contribution in rural household income) are accepted based on the results of this study.

The preferred species of edible and medicinal NTFPs have been captured and they need immediate attention as they may be threatened with extinction if left unchecked. An immediate action programme for participatory research into the ecology of the affected species and the domestication and commercialisation of all the priority species is recommended alongside other conservation strategies such as integrated local-level sustainable forest management approaches.

Harvesting and marketing commercial quantities of any NTFPs produces a measurable impact on the structure and dynamics of plant and animal populations, as well as the genetic composition of the harvested populations (Peters, 1996). In this case the most highly sought and extracted species may be in danger in the near future as long as there are no local-level strategies and practices towards sustainable use of the concerned NTFPs. It is clear that the harvesting rates of different species differ from ecological zone to ecological zone and between and within villages. Unfortunately both the flow of benefits and asset values of natural forests and woodland resources are not captured in the system of national Accounts in Swaziland (Hassan *et al*., 2002).

This may be due to one or all of the following factors:

1. Most of the direct benefits derived from natural forests and woodlands, such as indigenous edible vegetables, fruit and berries, are not commercially supplied and traded in the formal markets (Hassan *et al*., 2002). Lately indigenous medicines are flooding the modern town markets though.
2. Economic growth and development have taken place primarily through degradation of the natural environment as stock of renewable and non-renewable resources are depleted, and as such the National Accounting System purposefully disguises this depreciation. While depreciation of man-made capital appears as a cost GNP, the exploitation of natural resources appears a positive entry in the form of high economic activity (GOS, 1997).

Governments are urged to reconsider the interdependence of environment, economy and society with special consideration of the following primary functions of the forest environment:

1. providing raw materials;
2. acting as a sink/dumping ground for waste generated by life supporting activities;
3. providing life-sustaining services such as climate stability and soil and water supplies; and
4. supporting human beings, their cultures and livelihoods along with animal and plant habitats.

Considering the array of benefits and functions of the forest environment the National Accounting System should include or reflect these. This will be a milestone in the recognition of the contribution of the natural forests and woodlands to life on earth. Consequently, the sustainable development slogan will be practically realized.

A policy recommendation is that there is an urgent need to provide economic incentives for communities to become involved in sustainable forest management. There is need to develop and test economic incentive measures within the context of on-going attempts at community-based sustainable forest management, which generate tangible benefits in forms and at levels that are at least equal to compensate for the economic costs that accrue to communities.

CHAPTER 6: RESOURCE SURVEYS AND ECONOMIC VALUATION

6.1 INTRODUCTION

Resource assessment for NTFPs is a basis for improved resource management. The dynamics of the community and their livelihoods needs must be matched with the availability and dynamics of the natural resource in order to sustain development. Furthermore, the forest components and processes within both the physical and human environments provide the foundation and building blocks for the development of integrated, sustainable rural resource management policies, strategies and practices (Geldenhuys, 2002, 2003, 2004).

However, recent developments in NTFPs have shifted from valuing standing stock towards calculating direct use values of selected NTFPs as demonstrated in studies done by Godoy *et al.* (2000), Shackleton and Shackleton (2000, 2004, 2005), Shackleton *et al.* (2000), Dovie *et al.* (2001), Chipeto and Kowero (2004) and Clarke and Grundy (2004).

Nevertheless, for policy and strategy development it is important to undertake a resource inventory of NTFPs to assess the condition of the NTFPs resources in selected nominated forests. This would be followed by valuation of the existing species to monitor the abundancy of preferred NTFPs, and further investigate the economic potential of the remaining species to local livelihoods in the absence of top priority species. The resource survey is a means towards evaluation of potential inventory value from NTFPs species in the studied nominated natural forests and woodlands. This will also contribute towards a strategy to be developed for local-level sustainable forest management and conservation options, as well as income generation programmes from existing NTFPs species (Gluck, 2000; Geldenhuys, 2002, 2003, 2004).

In addition to that, natural resource valuation is composed of a series of techniques aimed at attaching monetary values on natural resources as a means of demonstrating their worth (Dovie *et al.,* 2001). The ultimate aim of many applications of natural resource valuation is to promote sustainable use of the resources and prevent degradation. The ultimate product of the resource survey would be development of pioneer programmes for modelling the sustainable natural forests and woodlands management for NTFPs in Swaziland as seen for miombo woodlands in Nhantumbo and Kowero (2001). This is further consolidated by Geldenhuys (2002) in his concept and approach towards development of sustainable resource use of NTFPs in bark harvesting for traditional medicine in South Africa.

There is a broad spectrum of studies on the economic valuation of natural woodland resources (Peters *et al.,* 1989; Chopra, 1993; Hedge *et al.,* 1996; Campbell *et al.,* 1997; Godoy *et al.,* 2000; Shackleton and Shackleton, 2000; Dovie *et al.,* 2001; Hassan *et al* 2002; Shackleton *et al.,* 2002). Thus the monetary valuation of NTFPs could be an effective incentive for conservation, and reducing land-use and land-cover transformation (Godoy *et al.,* 1993; Dovie *et al.,* 2001).

During the last decade concern has been expressed for the long-term effects of natural resource depletion and environmental degradation. This has resulted in the greening of national accounts by taking into account the changes in stocks of natural and environmental resources (Asheim, 2000). This is done through resource assessment and economic valuation (Dovie *et al.,* 2001).

Resource assessment is an evaluation of some aspects of the resource, based on information that is collected from a variety of sources, which can include socio-economic issues, market issues, or the quantity or quality of the resource (Wong *et al.,* 2001; FAO, 2001). The local, national, regional and international recognition of the role of NTFPs in the community-level livelihoods has stimulated scientific research into the inventory, distribution, classification and economic valuation of NTFPs, and most of all the bringing back of the previously marginalized NTFPs into forest management (Peters *et al.,* 1989; Godoy *et al.,* 1993, 2000; Hall and Bawa, 1993; Peters, 1996; Crafter *et al.,* 1997; Dovie *et al.,* 2001).

According to results of the analyses of several resource assessments for NTFPs, FAO (2001) categorized the uses of information from such inventories into various levels. Firstly, at the local level the resource assessment can be used to determine the sustainable harvesting quotas, to monitor the state and abundance/scarcity of the resource, as well as to demonstrate sustainability to convince authorities to allow harvesting. Secondly, at the national level resource assessment results help in strategic planning, such as in deciding whether to allow export quotas and to consider promoting resource-based industries. Thirdly, at the international level resource assessment results reveal information on endangered species (for example this is the information contained in CITES) which is however from national level data. Fourthly, at the highest level (usually international) the abstracts of resource assessment results are tabled in high forums pertaining to discussions of criteria and indicators for sustainable forestry, forest certification and the Convention on Biological Diversity.

Resource assessment for NTFPs is a field of confusion and complexity, with many overlapping approaches. The underlying reasons for this include: the diversity of different

plants and animals that can be classified as NTFPs; the variety of plant or animal parts that can be used; the broad range of geographical and cultural situations; the range of different disciplines undertaking studies (sociology, agriculture, zoology, forestry, botany and many more); the diversity in the scale of the resource assessments; the varying aims for the assessments; and the amount of time, and level of human and financial resources available (Wong, 2000; FAO, 2001).

The current study will make use of a combination of some the above concepts of resource inventory and economic analysis, and will be in a case study scenario, where the four ecological zones of Swaziland will be specifically assessed.

6.2 SPECIFIC OBJECTIVE

To conduct resource surveys to assess the condition and actual quantities of standing stock of species for edible and medicinal NTFPs, and to do an economic analysis of the value of the standing stock.

6.2.1 *Associated Research Question*

- ✓ What is the actual status of the preferred edible and medicinal NTFPs in the natural woodlands in terms of species distribution, i.e are key NTFPs species still available, and in what quantities?
- ✓ What is the likely income if the standing stock were to be harvested and sold at current local farm gate prices?

6.2.2 *Hypothesis to be tested*

Hypothesis 6: Increased demand for NTFPs leads to the depletion of edible and medicinal NTFPs, which may promote natural forest/woodland degradation and deforestation

6.3 METHODS

6.3.1 Selection of study sites

The study sites were selected based on the following three key criteria:

1. The sites have to be distributed across the four ecological zones to capture and represent the eight forest types. This would also capture the variability in climatic and

socio-economic conditions between those regions across the country (modified from Falconer, 1992; FAO, 2001; Hassan *et al.,* 2002).

2. The sites should comprise natural forests and woodlands adjacent to rural communities that harvest, collect or extract NTFPs on a full-time basis. This renders the selected natural forests and woodlands of significant economic, social and cultural, ecological and environmental importance to the local communities (modified from Balick and Mendelson, 1992; Appasamy, 1993; Chopra, 1993; Godoy and Bawa, 1993; Godoy *et al.,* 1993; McKenney and Sarker, 1994; FAO, 1993; Crafter *et al*., 1997; Gram, 2001; Geldenhuys, 2002; Shackleton, 2002).
3. The natural forests and woodlands selected for the study should be shortlisted from the list of nominated forests developed during community consultations (modified from FAO, 2003a).

Based on the above selection criteria the following nominated natural forests and woodlands were studied, and details are presented in Table 6.2. A list of nominated natural forests/woodlands is given in Table 6.1.

Table 6.1: Nominated Forests in each of the study site under the various ecological zones with selected forests on top and highlighted in bold

Hhelehhele North-Highveld	**Grand Valley/Kakholwane-Middleveld**	**Siphofaneni-Lowveld**	**KaShewula-Lubombo**
✓ **Lufafa** ✓ Epulazini ✓ Umshiyelangubo	✓ **Umtfumunye** ✓ Nkonono ✓ Endvosi ✓ Emgijaneni ✓ Batsakatsi ✓ Emoti	✓ **Hlutse** ✓ KaZakala ✓ Sigcaweni ✓ Othandweni ✓ KaJimba	✓ **Shewula Nature Reserve** ✓ Esiweni ✓ Egabaza ✓ Enkalashane ✓ Kufongo ✓ Etimbutini ✓ Emangoleni

In Swaziland, national forest inventories for natural forests and woodlands were carried out in 1990 and 1999. However, the inventory of NTFPs is a very new concept. No research has been undertaken so far except this current study. The quantitative inventory of NTFPs in this study is specific to medicinal and edible forest resources.

6.3.2 Inventory and Economic Valuation

6.3.2.1 Inventory

The methods used here for the inventory and economic valuation were modified from Sharma and Bhatt (1982), Peters *et al.* (1989), Hess *et al.* (1990), Balick and Mendelson (1992), Hall and Bawa (1993), Peters, (1996), Campbell *et al.,* (1997), Lund (1997, 1998), Peters and Tode (1998), Robles-Diaz-De-Leon and Kangas (1999), Wong, (2000), Wong *et al.,* (2001), Neuman (2003) and Richards *et al.,* (2003).

Step One: Literature search and interviews

Available literature from local and regional sources was reviewed. In addition, key informant interviews were conducted with a total of 28 subject matter specialists, 40 traditional healers and 136 local collectors in order to find information, where possible, on the following aspects: Preferred species; abundance; impacts of harvesting; annual yields; species regeneration rates; age at maturity of various species; normal time of harvest; ecology of study sites; geology of study sites; soil characteristics; maps and area covered by study sites; unit prices; rotation of the forest resource /productive lifespan of forest in the specific sites; climatology of the sites; homogeneity or heterogenity of sites; flowering and fruiting phenology; common names; and confirmation of species botanical names (modified from Peters *et al.,* 1989; Balick and Mendelson, 1992; Falconer, 1992; Chopra, 1993; Hall and Bawa, 1993; Peters, 1996; Robles-Diaz-De-Leon and Kangas, 1999; FAO, 2001). All the above parameters will help in the compilation of a rigorous inventory report and the computation of the inventory value of the study sites.

The breakdown of the key informant interviews was as follows:

- Ministry of Agriculture and Cooperatives' Forestry Section=10 experts
- University of Swaziland=10 experts
- Ministry of Natural Resources and Energy=5 experts
- Ministry of Tourism, Environment and Communications=5 experts
- Swaziland National Trust Commission=5 experts
- Swaziland Institute of Research on Medicinal and Food Plants=3 experts
- Traditional healers=40 practioners
- Local collectors=136 individuals

The information gathered was recorded in a notebook for later reference.

Step Two: Community Meetings

Two community consultation meetings were carried out to brief the communities adjacent to the study sites about the importance of the proposed resource inventory in the management and planning process for their NTFPs and to call for their full co-operation. This procedure followed the same trend as the community consultations that were held for the development of the new National Forest Policy in 2001/2002 and a slight modification of the work of Hall and Bawa (1993), Peters (1996), Campbell *et al.* (1997), Balick and Mendelson (1992) and Gram (2001). Each meeting was targeted to cater for forty people to be divided into four groups of ten. There were about 20 men and 20 women in the community consultation meetings at all times. Later five local men were chosen from the community meetings to join the technical inventory team for the duration of the inventory exercise. Even though women were fully represented and participated actively in the consultations, they did not participate in the technical inventory team due to cultural reasons. In addition to these men, other interested volunteers were called to help the inventory team. These men attended a two-day training in basic forest inventory and participatory methods.

There were five men from the local community in each study site with a research team of four technical assistants (one per study site) lead by the project leader (myself).

Step Three: Sampling Design and Procedure

The natural forests and woodlands studied varied in size, latitude, and longitude and species distribution. This is a good basis for comparison. Details of the size and location of the study sites is presented in Table 6.1.The method followed in the layout of sampling plots was modified from Hess *et al*.,(1990) and DANCED (1999).

1. (A) There was a maximum of ten main sampling plots of maximum 50 m x 50 m or 0.25 ha area per study site (modified from Sharma and Bhatt, 1982; Avery and Burkhart, 1983; Peters *et al.,* 1989; Hall and Bawa, 1993; Balick and Mendelson, 1992; Peters, 1996; Wong *et al.,* 2001), depending on the homogeneity or heterogeneity of the site (for tree sized individuals).

(B) Within a 50 m x 50 m sample plot, there were four strips of 50 m x 12.5 m for the ease of counting trees (for tree individuals). Information recorded: common name, species name,

DBH, height, productive life span (where possible), number of individuals, annual production per individual species, size, unit price, total value and other comments.

(C) Within 50 m x 50 m sample plots there were four square sub-plots of 25 m x 25 m for the ease of counting small trees, bushes and shrubs. Information recorded: common name, species name, productive life span (where possible), number of individuals, annual production per individual species, size, unit price, total value and other comments.

(D) Within the 50 m x 50 m plots there were 16 square sub-plots of 12.5 m x 12.5 m for the ease of counting under-story individuals (mushrooms, berries, vegetables, herbs and other). Information collected: common name, species name, productive life span, number of individuals, annual production per individual species, size, unit price, total value and other comments. An illustration of the breakdown of sampling plots is shown in Figure 6.1.

Additional parameters that were considered for the record are: topographic features, soil conditions, and general description of changes in habitat across the sample plots (Hall and Bawa, 1993). Refer to Appendix 11 for a specimen of the data recording forms.

2. The inventory design followed a Nested Sampling approach, i.e. a sample of larger plots was selected with a systematic group of sub-plots in a fixed pattern within the larger plots and even smaller plots within the sub-plots (Figure 6.1; modified from Sharma and Bhatt, 1982; Avery and Burkhart, 1983; Hall and Bawa, 1993; Ott, 1998; Campbell *et al.,* 1997; Peters, 1996; Dlamini, 1998; Peters and Tode, 1998; Wong *et al.,* 2001).

3. The enumeration method to be followed is that of a tally with counts of target individuals on plots (Balick and Mendelson, 1992; Hall and Bawa, 1993; Peters *et al.,* 1993; Peters, 1996; Wong, 2000).

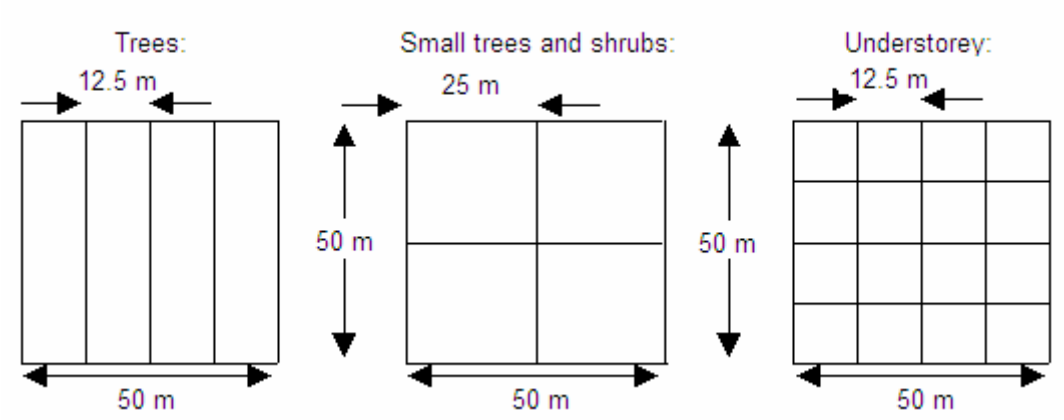

Figure 6.1: An illustration of the design of main plots and two levels of sub-plots for the resource surveys.

Step Four: Layout of the sampling plots in the field

Four study sites were selected in each of the four ecological zones of the country and four coordinates were established as boundaries for each sampling site and called A, B, C, and D as shown in Table 6.1. The Local Lo 31 System was used in the marking of boundaries around sampling sites and the extend area was given in hectares.

1. Middleveld, Grand Valley (KaKholwane): Umtfumunye natural woodlands

The starting point was a *Methula homestead* where there is a *Combretum spp.* tree. The first point was located 220m from the tree, and the next points were located in the northerly direction at 300m intervals, and parallel to these in the same order were the last five points. The points form a grid as shown in the orthophoto map in Figure 6.2. The total area within the four coordinates is approximately is 284.44 ha.

2. Lubombo Plateau: Shewula Nauture Reserve

The starting point was 220m from sampling plot 5. The sampling plots are located at 400m intervals as shown on the orthophoto map in Figure 6.3. The total area within the four coordinates is approximately 269.10 ha.

3. Lowveld (Siphofaneni): Hlutse natural woodlands

The starting point was at the intersection of a river escarpment and fence boundary. The starting point was 100m from the first sampling plot. There after the other plots are distributed

at 200m intervals to the east of the first column of the sampling plots. The total area within the four coordinates is approximately 206.50 ha (See Figure 6.4).

4. Highveld (Hhelehhele North): Lufafa natural woodlands

The starting point was located 74m from the first sampling point. The points 1, 4, 7, and 10 are located at 200m from each other and form a line as do points 1, 2 and 3 and 4, 5 and 6. Sampling points 5, 8 and 11 are also linear and are also at 200m away from each other. The total area within the four coordinates is approximately 218.79 ha (See Figure 6.5).

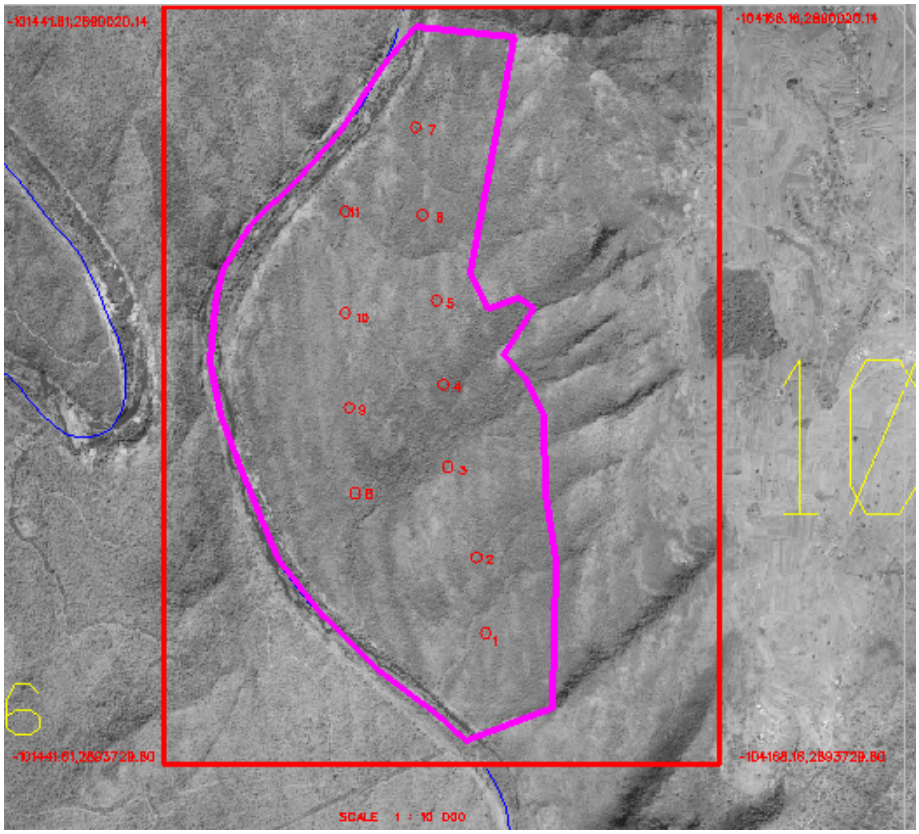

Figure 6.2: Map of a section of the Mtfumunye natural woodlands in the Grand Valley (Middleveld of Swaziland) showing the distribution of sampling plots for the resource surveys.

Figure 6.3: Map of a section of the Shewula Nature Reserve (Lubombo Plateau of Swaziland) showing the distribution of sampling plots for the resource surveys.

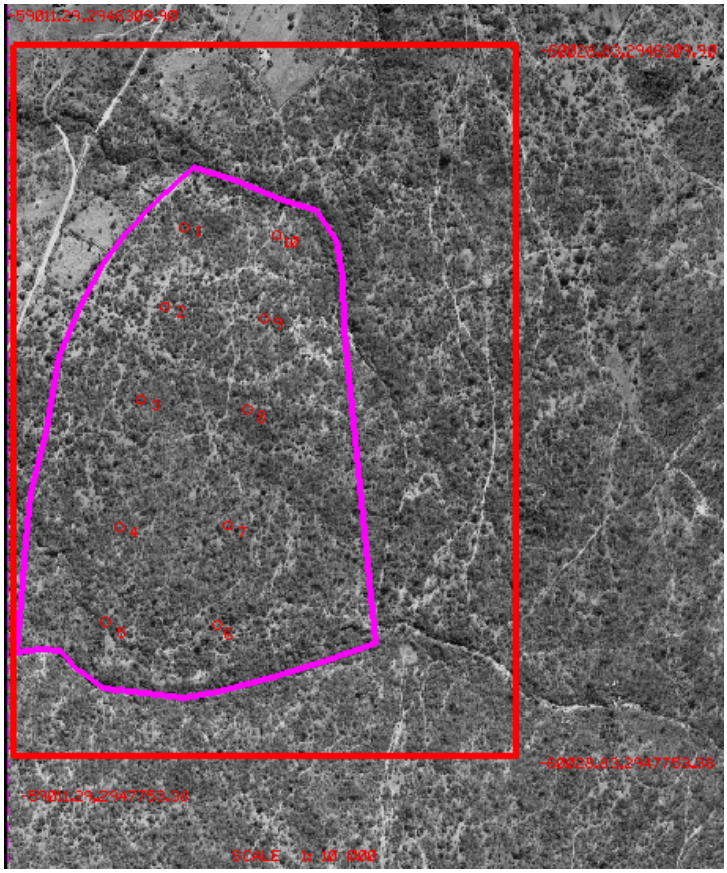

Figure 6.4: Map of a section of the Hlutse natural woodlands at Siphofaneni (Lowveld of Swaziland) showing the distribution of sampling plots for the resource surveys.

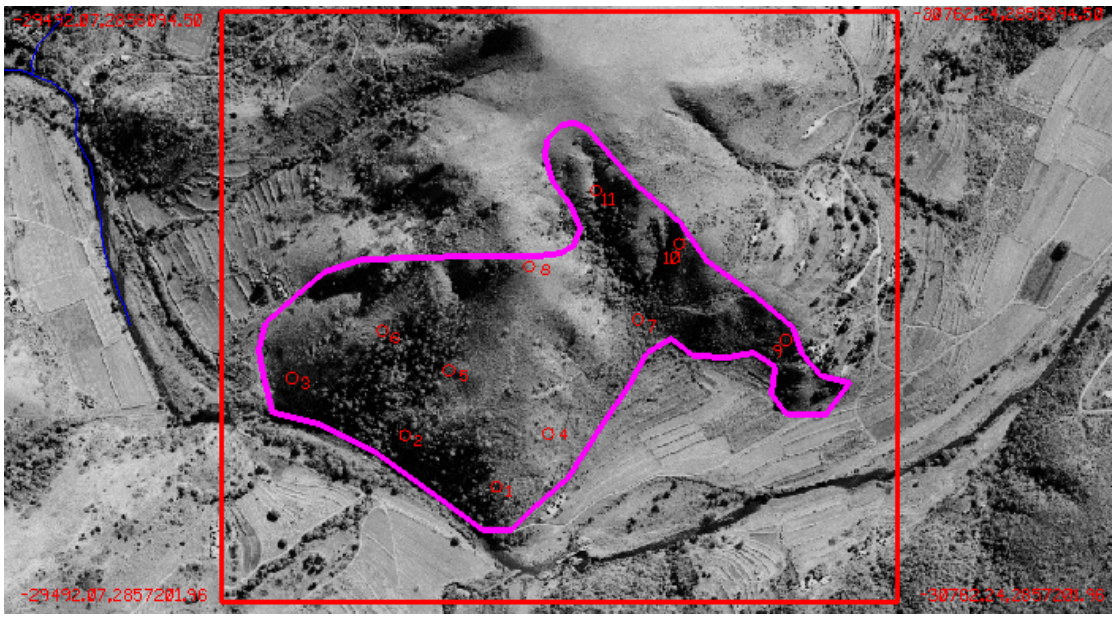

Figure 6.5: Map of a section of the Lufafa natural woodlands at Hhelehhele North (Highveld of Swaziland) showing the distribution of sampling plots for the resource surveys.

Table 6.2: Location and size of the resource survey sites in the 4 natural forests and woodlands nominated in the 4 ecological zones
(the ten sampling plots per site fall within the four coordinates, A, B, C and D in each natural woodland in the four ecological zones)

Ecological zone	Natural woodlands (Area)	Points/Coordinates within which the sample plots were located	System Lo 31 Metric	
			Y	X
Lubombo Plateau	Shewula Nature Reserve **(269.10 ha)**	A	-104164.29	2890026.46
		B	-104164.29	2893683.07
		C	-101572.16	2893683.07
		D	-101572.16	2890026.46
Middleveld	Umtfumunye **(284.44 ha)**	A	-42766.67	2956217.45
		B	-42766.67	2958681.43
		C	-40903.51	2958681.43
		D	-40903.51	2956217.45
Lowveld	Hlutse **(206.50 ha)**	A	-60008.08	2946272.60
		B	-60008.08	2947765.17
		C	-59006.25	2947765.17
		D	-59006.25	2946272.60
Highveld	Lufafa **(218.79 ha)**	A	-30797.06	2856076.01
		B	-30797.06	2857423.90
		C	-29533.29	2857423.90
		D	-29533.29	2856076.01

6.3.2.2 Economic Valuation

1. Equation for calculating the **Inventory Value**, equivalent to the annual revenue derived from the standing stock of edible and medicinal plant species (Peters *et al.,* 1989; Balick and Mendelson, 1992; Godoy *et al.,* 1993):
    a. Trees/Shrubs: Total value = number of trees X annual yield per tree X unit price
    b. Under-storey: Total value = number of individuals X annual production X unit price

The inventory value of the standing stock is equivalent to the annual revenue that is likely to be earned through harvesting 100% of the standing stock for sale at local or farmgate prices in consideartion of the followiong underlying factors:

1. Extraction costs are largely very low as none of the resources harvested require specialist tools, usually just a peak or an axe or a bushknife and such tools are used for a multitude of uses within the household. Transport used for conveying edible and medicinal NTFPs was mainly ‘walking’. Thus, once the capital cost is spread over a number of different uses and

then subject to a discount factor over the life of such a tool, then the annual cost or cost per unit harvested is negligible (Shackleton and Shackleton, 2000). Furthermore, the collecting containers for the NTFPs were old sacks and used plastic bags.

2. The impact of opportunity cost of labour were also very small, firstly because the daily rates paid for labour collecting NTFPs does not exist within the rural areas, as these products are collected by women and children as well as unemployed men, and there is a large surplus of unskilled labour. So the application of opportunity cost of labour under such circumstances would be unrealistic (Shackleton and Shackleton, 2000).

6.4 DATA ANALYSIS

Statistical Analyses

Although it was stated in the information given under experimental design and sampling procedure that it was a nested design, it was not a planned experiment, but a survey. Therefore appropriate analyses of variance (Proc GLM with SAS) were used to analyse the data.

Statistical procedure

The data were continuous data. Appropriate analyses of variance were performed using SAS version 8.2 (SAS, 1999). The Shapiro-Wilk test was performed to test for non-normality (Shapiro and Wilk, 1965). Student's t-Least Significant Difference was calculated at the 5% confidence level to compare treatment means (Ott, 1998).

The Statistical model:

$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$

Where:
μ =population mean
α_i =main effect (site or species)
ε_{ij} = error

(Analysis of variance for a one-way classification)

In some cases where evidence of non-normality was found, it was due to high kurtosis and not skewness. A magnitude of similar values was responsible for the kurtosis. According to Glass *et al.* (1972) these analyses are valid.

Analyses of variance for the main effects: Site, and Species were done.
Although Species are usually seen as observations, it was decided to use species as a factor.

6.5 RESULTS

6.5.1 Species distribution in nominated natural forests and woodlands

Resource surveys were undertaken in 4 nominated natural forests and woodlands across the four ecological zones of rural Swaziland with one from each ecological zone. A full range of the species in the various nominated natural forests and woodlands in the four ecological zones of Swaziland is presented in Appendix 9 with a summary of the results in Table 6.3. Table 6.4 summarizes the resource evaluation information for the different study areas, and Table 6.5 gives the ANOVA results. Even though the differences in number of species was

Table 6.3: Species distribution in terms of number of individuals per species per category in the various natural forests and woodlands, from Resource surveys

Study Area	Hhelehhele North	Shewula	Siphofaneni	Grand Valley
Landscape Area	Highveld	Lubombo Plateau	Lowveld	Middleveld
Name of Forest	Lufafa	Shewula Nature Reserve	Hlutse	Umtfumunye
Species total	18	18	12	34
Stems total	41	58	51	160
Categories	**Number of individuals (Number of species)**			
Edible plants	22 (7)	13 (8)	15 (6)	62 (15)
Medicinal plants	16 (11)	24 (11)	23 (6)	88 (26)
Multipurpose plants	3 (3)	21 (3)	13 (4)	10 (7)
Trees	21	31	35	62
Shrubs	11	12	11	26
Under-story	2	10	3	12
Other	7	5	2	60

not statistical significant, they do show some patterns. Umtfumunye natural forests and woodlands, in the Middleveld, had the highest number of species, for both edible and medicinal NTFPs. The Shewula Nature Reserve, in the Lubombo Plateau had the highest

number of multi-purpose plant species. Hlutse, in the Lowveld, had the lowest number of species. Overall the findings of the study indicate that the natural forests and woodlands selected for the resource surveys are denuded or heavily depleted of the preferred tree species of edible and medicinal NTFPs. As a result there were far too few tree species per sampling plot and it is not possible to establish relative frequencies of tree species based on DBH and height. Whilst it is the most important output from a resource inventory point of view to establish resource status through realative frequency of tree species based on DBH and height, only the number of individuals per species was considered for assessment of resource status in the sampled areas. The results of the inventory and economic valuation (Table 6.4) indicated high significant differences in inventory value, yields and unit prices between the four nominated woodlands (Table 6.5).

Table 6.4: Summary statistics of Means for Inventory and Economic Valuation in the various study sites

Study Area	Hhelehhele North	Shewula	Siphofaneni	Grand Valley
Landscape area	Highveld	Lubombo Plateau	Lowveld	Middleveld
Name of Forest	Lufafa	Shewula Nature Reserve	Hlutse	Untfumunye
Number of species	18	18	12	34
No. of stems per species per ha	20.1	36.1	23.5	20.2
Inventory Value per ha (US$)	230.8	785.2	852.0	510.0
Unit prices per species (US$)	7.6	12.0	11.5	14.6
Annual yield per ha (kg)	20.9	31.5	43.1	17.8

Exchange rate: 1US$ is equivalent to R6.50 as at 2004 (Times of Swaziland, 2nd March2004).

Table 6 .5 ANOVA for Inventory and Economic Valuation in the various study sites

Source of variation	Degrees of freedom	Mean Squares	P-Values
No. of stems per species	3	10464924.2	0.1100
Inventory Value per ha	3	229.1	0.0050
Unit prices per species	3	23843.7	0.0034
Annual yield per ha	3	587.1	0.0008

Exchange rate: 1US$ is equivalent to R6.50 as at 2004 (Times of Swaziland, 2nd March2004).

The findings of the inventory have shown that the Siphofaneni woodlands in Hlutse had the highest number of individual stems per species per ha, while the Hhelehhele North woodlands

in Lufafa show the lowest population per ha. Unit prices were variable. The highest inventory value came from Hlutse as well and the lowest from Lufafa. Annual yield was highest Hlutse and lowest at Mtfumunye woodlands in Grand Valley.

The specific objective of assessing the condition of the natural forests and woodlands in the selected study sites was accomplished. The obvious sign that the condition of the forest is poor is shown by the disappearance of the so-called key species of edible and medicinal NTFPs. A list of some of the already missing species is given in Table 6.6. In addition to the disappearance of important species, patches of bare land were most noticeably in all the sampling plots in the nominated woodlands in all study sites.

Table 6.6: List of missing common/key species (according to available local literature and community consultations) in the inventory results across study sites

Edible species:	**Medicinal Species:**
Psalliota campestris	*Pittosporum viridiflorum*
Aloe maculata	*Drimia delagoensis*
Syzygium cordatum	*Schotia brachypetala*
Ficus sur	*Manilkara species*
Cephalanthus natalensis	*Harpephyllum caffrum*
Lannea discolor	*Encephalartos species*
Vangueria infausta	*Senecio rhyncholaenus*
Lantana rugosa	*Pterocarpus angolensis*
Berchemia zeyheri	*Maesa lanceolata*

6.6 DISCUSSION

The resource survey of 10 (50 m x 50 m) sampling plots per study site resulted in a total of 40 sampling plots over the four ecological zones within the nominated natural forests and woodlands (Lufafa, Shewula Nature Reserve, Hlutse and Umtfumunye). The Umtfumunye woodlands in the Middleveld had the highest number of species over the sampled area. The same woodlands had the highest number of stems of edible plants, medicinal plants, and multi-purpose plants. The Umtfumunye woodlands in the Middleveld had the largest number of tree species, shrubs species, under-story species and other species compared to the rest of the nominated woodlands from other ecological zones (Appendix 9). The Umtfumunye natural woodlands fall under the Mixed woodlands forest stratum, which is the richest with regard to species diversity amongst all the forest strata according to the Hess e*t al*. (1990) and

DANCED (1999) national forest inventories. The Shewula Nature Reserve had the highest number of individual stems per species per ha.

This resource assessment for edible and medicinal NTFPs clearly concur with this aspect of the previous national inventories, as the Middleveld study site has the highest number of species above all the other study sites that fall under other forest strata. The resource assessment show that the Hlutse natural woodlands have the lowest number of edible and medicinal NTFPs species (12 species), while the Lufafa natural woodlands and the Shewula Nature Reserve have 18 species each. According to Hess *at al*. (1990) and DANCED (1999) the Hlutse woodlands fall under the *Acacia* savanna forest stratum which is limited in the number of species available, and the same reports show that the Lufafa woodlands fall under the Montane and Highland forest stratum which also has a few species but is slightly better than the Acacia savanna. This resource assessment is congruent with that. The Shewula Nature Reserve falls under the Mixed woodland stratum, but the number of recorded species is far below those in the Umtfumunye natural woodlands, which falls in the same stratum. Subsequent research into this strange phenomenon is necessary.

A notable observation is that all the study sites share the same multi-purpose plant species. These are: *Aloe maculata, Berchemia zeyheri* and *Sclerocarya birrea* (the latter was scarce in the highveld). This is a good indication that these species are both multi-purpose and well adapted to the varied altitudes and climatic conditions of the four ecological zones of the country. Another important observation is that trees are the most dominant preferred species of edible and medicinal NTFPs followed by shrubs and lastly the under-story species, across all the studied natural woodlands. During the resource surveys it was noted that there are some edible wild mammals living in all the sampled natural woodlands, and the community volunteers taking part in the surveys disclosed that there was some hunting and bushmeat is utilized though mainly during the summer season.

There were no statistically significant differences in the inventory values of the standing stock of edible and medicinal NTFPs between sites. The results, however, show a range between US$85.2 and US$230.8 per hectare between sites. There were no significant differences between species in inventory value but the range of the top ten species was between US$4395.2 and US$752. These values are lower than those of the annual yield and market value of fruit and latex produced in 1 ha of forest at Mishana, Rio Nanay, Peru of US$697 per ha (Peters *et al.,* 1989). This could be attributed to the fact that in the current study a totally different set of species of NTFPs were assessed. However, comparatively, the inventory values of this study are higher than those found by Robles-Diaz-De-Leon and Kangas (1999)

through an economic model for the harvesting of NTFPs from a riparian forest model buffer zone in Chesapeake Bay region in Maryland in the USA. The gross income from the model forest was estimated at US$61.2 per ha per year.

Economic valuation of the standing stock gives the inventory value of the forest/woodland portion in terms of the specific products under consideration (Godoy *et al.,* 1993, 2000; Robles-Diaz-De-Leon and Kangas, 1999). The inventory value of the NTFPs is a conservative figure because the natural forests and woodlands also produce other benefits, such as biological diversity and environmental services (Godoy *et al.,* 1993, 2000; Peters *et al.,* 1993; Dovie *et al.,* 2001). Policy-makers and decision-makers as well as development organizations need an accurate estimate of the opportunity cost of the forest to evaluate proposed projects and filter out economically disadvantageous ones. Under some circumstances leaving the forest unlogged and using it to get non-timber forest goods and environmental services may be socially and economically optimal (Godoy *et al.,* 1993). This may be verified through the use of Cost Benefit Analysis (CBA) of Forest Land Use Options (Bishop, 1999). The strength of a CBA is the use of explicit and directly comparable decision criteria. The underlying logic of CBA is that, for any given set of alternative activities (e.g. land use options), the net benefits of each should be compared, where the net benefits (NB) of a given option are simply the sum of benefits (B) less the total costs (C): NB = B-C. Thus for any two alternative land uses, A and B, the net benefits of A (NB^A) must exceed the net benefits of B (NB^B), if A is to be the preferred land use option on purely economic grounds, hence: $NB^A - NB^B > 0$ (Bishop, 1999).

To overcome the challenges of NTFPs resource assessments, there are three spatial scales on which a successful approach can be based and these are: Species, Community and National (Wong, 2000). At the species level there should be better understanding of how to design biometric sampling schemes, suitable mensuration techniques, effective monitoring strategies and for analyses including the determination of sustainable yield of individual species. At the community level (village) these technical problems are exacerbated by the need for protocols suitable for use by the community. Local communities have impeccable local knowledge and experience of the ecology and management of NTFPs. A vital step towards promoting community management of these resources is the integration of local knowledge systems and scientific knowledge. At national or macro scale these issues are compounded by the need to integrate NTFPs into the multi-purpose national forest inventory designs.

6.7 CONCLUSIONS AND RECOMMENDATIONS

The study shows a varied distribution and economic values of species between plots within sites and between sites and between plots irrespective of sites, though not statistically significant. This is seen in the figures representing the total number of species in each site, the total number of individuals of edible plants, total number of individuals of medicinal plants, the total number of multi-purpose individual plants, and the number of tree species, shrub species, under-story species and other species.

During the resource assessment it was evident that the distribution of preferred species of forest foods and forest medicines is sporadic and erratic. There were open patches of bare land within the sampling plots and rills, gulleys and dongas between sampling plots. This is a clear sign of mismanagement of the natural forests and woodlands resulting in over-exploitation and unsustainable harvesting of timber and NTFPs leading to forest degradation and disappearance of some species of high socio-economic value. Such key species include: Edible NTFPs: *Psalliota campestris, Aloe maculata, Syzygium cordatum, Ficus sur, Cephalanthus natalensis, Lannea discolor, Vangueria infausta, Lantana rugosa, Lannea discolor, Berchemia zeyheri*, edible termites, edible locusts, edible caterpillars and many more edible species. Medicinal NTFPs: *Pittosporum viridiflorum, Drimia delagoensis, Schotia brachypetala, Manilkara spp., Harpephyllum caffrum, Encephalartos spp., Senecio rhynchloaenus, Pterocarpus angolensis, Maesa lanceolata* and many more medicinal species. The hypothesis 5.1 that says, "Increased commercialization of NTFPs leads to depletion of edible and medicinal NTFPs, which may promote natural forest/woodland degradation and deforestation" is accepted.

The following issues and recommendations emanate from the study:

Issue: Though the exact rate of extraction of forest products from the studied natural forests and woodlands is not known, it is apparent that the current harvesting intensity of timber and NTFPs is very great, and there may not be sufficient propagules for dispersal for regeneration and the preferred species populations will rapidly go extinct. Already most of the species mentioned above are scarce, threatened or extinct in all the study sites. This was confirmed by informal interviews with the resource inventory team of local volunteers who mentioned that most species have disappeared due to overexploitation without proper management of the source habitats.

Recommendation 1: It is therefore, strongly recommended that appropriately designed resource inventories are undertaken to capture the status of the resource and to understand resource dynamics and response to use (Geldenhuys, 2003).

Recommendation 2: The approach to resource conservation should change from the protectionist approach where local resource users are prohibited from harvesting NTFPs from adjacent forests by the law, to the participatory resource management approach where all potential users are involved in natural resource management. Governments, NGO's, the private sector and academia should be integrated in all the stages of natural resource management. This new system has been successful in sustainable forest management (Abubakr *et al*., 1997).

Issue: The inventory values, net annual revenue, net present values, and annual yields and unit prices per species in the four study sites show that the NTFP sub-sector is an economically viable business sector. However, presently communities are not making efficient and economic use of NTFPs by setting up small processing industries.

Recommendation 3: Government and other institutions should support the development of small sustainable industries specializing in the processing of natural forests and woodland products. Communities need to be advised on the options for small industries and the possibilities of financial and technical assistance. The benefits of industries such as bee keeping, food collection, woodcarvings include increased employment through additional labour inputs and increased revenue through value addition to the forest product.

Issue: The current land tenure system of Swaziland has a huge impact on the use and management of forest resources from the communal areas.

Recommendation 4: It is suggested that participatory management can improve control of resource use. Therefore, efforts should be made to organize local communities to promote effective participatory management of natural resources.

Issue: Most of the national policies and laws do not specifically address issues related to the NTFPs of socio economic importance that enhance the livehoods of rural communities that reside adjacent to natural forests and woodlands.

Recommendation 5: It is recommended that appropriate laws should adopt the following features:

1. To recognize the full extent of local demands of the forest resource;
2. To fully consider the local knowledge of the resource that has developed over time;
3. To engage nearby communities as stakeholders in managing the resource, ensuring their commitment to long-term management goals;

4. To engage the energies of local people in their own economic change, which can include decisions on social and cultural priorities that outsiders do not realize; and
5. Substitution of resources; preserving scarce NTFPs and utilising suitable alternatives.

The challenge ahead is to develop single and multi-purpose forest resource inventories and data analysis procedures ranging from the local to national level without excluding the beneficiaries (communities); this is in simple terms to adopt a participatory resource assessment process involving the indigenous/local people (FAO, 2001). It is imperative to formulate guidelines for long-term and interdisciplinary monitoring of the use of NTFPs (Crafter *et al.,* 1997; Geldenhuys, 2002, 2003, 2004; Amsallem *et al.,* 2003).

Other challenges encountered in working with NTFPs would be short-listed as follows: difficulties with traditional forestry designs; lack of properly tested sampling designs tailored for NTFPs; few NTFPs mensuration techniques available; little cross-disciplinary exchange of ideas or techniques; and conceptual and practical difficulties in the determination of sustainable yields (Wong, 2000, FAO, 2001). Problems with NTFPs resource inventories also come due to: the rarity, clumped distribution, imperfect detectability, seasonality, mobility (in case of animals) and quantification of yield for non-destructive harvesting, for NTFPs only a small part of the individual is harvested, as opposed to methods for determining timber yield where the whole individual is harvested (Peters *et al.,* 1989; Hall and Bawa, 1993; Peters, 1996; Wong *et al*., 2001; FAO, 2001).

CHAPTER 7: IMPLICATIONS FOR THE SUSTAINABLE MANAGEMENT AND DEVELOPMENT OF NTFPs

7.1 POLICY IMPLICATIONS

The findings of this study have shown that NTFPs are of significant socio-economic use with direct use values and benefits at the local and national levels in Swaziland. According to Dovie (2003b) inadequate policy recognition has however led to the underestimation of the role of NTFPs in sustaining rural economies. Furthermore, policy makers are not yet sure what government, the private sector, or local communities can do to preserve an optimum level of forest biodiversity (Bhattarai and Hammig, 1998). As an intervention, it is therefore necessary to ensure their sustainable use and management through proper management systems that should be provided for in the national and international policies and legislation relevant to the NTFP sector. To facilitate the sustainable management and development of NTFsP in Swaziland, a new theoretical framework has to be recommended in accordance with Specific Objective 6 of this study, i.e. to formulate and develop a theoretical framework for the sustainable management of NTFPs in natural forests and woodlands.

The existing national policies and legislation, including the National Criteria and Indicators for Sustainable Forest Management, contain elements and issues of NTFPs but to a lesser extent compared to the existing international policies and legislation. This has made it difficult to develop NTFPs at the local and national levels, despite their ecological, environmental, social, cultural, spiritual, and economic roles in the country. The lack of a broader stakeholder participation and involvement, including resource users or local communities, in policy and legislation formulation processes was highlighted as one of the reasons for the weak and ineffective policies. In this study a new 4-Step hierarchical approach to policy and legislation review and analysis was developed and presented (Chapter 2). At Step 4, an in-depth assessment was made of a total of 16 national and international policies and legislation based on 21 criteria for assessment (see Table 2.5 and Table 2.6 in Chapter 2). This will form a basis for the improvement of future natural resources management policies and legislation.

The past national studies on the economic valuation of selected NTFPs reflect their significant contribution to livelihoods at the local and national levels. The research was aimed at investigating the importance of NTFPs in rural livelihood security and as safety nets. With a limited budget the logical first step was a desk top literature search. The second study was an empirical study at a national level thus comprising a low sample intensity. A closer analysis of the past studies showed that there is a profound lack of information on the status of NTFPs

in the country. Therefore, there is still a great need for research on the qualitative and quantitative statistical data on the status of the full range of NTFPs (goods and services) in Swaziland. A similar concern was raised by Shackleton and Shackleton (2004) from a research study conducted in South Africa on the emergency net function which serves as an insurance in times of misfortune, such as drought, diseases, and economic recessions. This would give a true economic value of the direct and indirect use benefits and intermediate use services of the natural forests and woodlands to the national economy. Omission of the total value of NTFPs in the SNA in Swaziland leads to government not recognizing the value attached to NTFPs thus resulting in easy land conversion from natural forests and woodlands to other land use options (e.g. Agriculture). An urgent motivation through national resource and environmental accounting studies is necessary to safeguard decision makers regarding the selection and approval of development projects.

The up-to-date list of main categories of NTFPs (goods and services) compiled in this study is in line with those in recent regional and international studies and makes it a useful tool in the classification of NTFPs. The matrix displaying multi-purpose properties of species of commonly used NTFPs in Swaziland is a good basis for species selection for local and national level domestication and commercialization initiatives. The re-classification of the major categories of NTFPs, the ranking of top priority NTFPs species and the recommendation for the formulation and development of a standard procedure for economic valuation of NTFPs in this study is an improvement of work carried out in Swaziland by DANCED (2000b) and Hassan *et al.* (2002).

Local communities lack knowledge of the existing policies and legislation that safeguard the sustainable use of NTFPs in the adjacent natural forests and woodlands, and further stated that there are no existing traditional local-level NTFPs management systems. This is confirmed by the ongoing overexploitation and unsustainable use of NTFPs leading to the current accelerated rate of deforestation and forest degradation. Uncontrolled trade in NTFPs, by non-resident collectors, in South Africa has been seen to be one of the inevitable threats to forest biodiversity (Dovie, 2003b). This reaffirms the weak and ineffective national policies and legislation, and shows that the existing policies and legislation are not implementable. Proper and innovative policies and legislation need to be put in place to cope with the current challenges. The positive side is that local communities have identified potential threats to forest biodiversity. Though some of them may not be aware of the opportunity cost of the adjacent natural forests, all local communities are willing to participate in the conservation and sustainable use of the adjacent natural forests and woodlands. Most local communities already have initiatives towards selection of top priority species for domestication and

commercialisation, and that is an opportunity for sustainable NTFPs management and development. The institutional, cultural, socio-economic, ecological/environmental and policy issues raised by local communities highlighted in Chapter 3 are a crucial and essential element for the formulation and development of guidelines for local-level sustainable management and development of NTFPs.

This study captured a wide variation of NTFPs utilization as recommended by Godoy *et al.* (1993) and FAO (2001), and this will enable the results to be used for generalization. The method used in the economic valuation of NTFPs is an improvement of that suggested by Godoy *et al.* (1993, 2000), in that this study considered assessing the use of NTFPs at the village doorstep as well as those that are utilized before the doorstep. This has resulted in higher quantities and values per household compared to previous studies. The user surveys showed the variation, between and within the specified villages across the four ecological zones of Swaziland, in the actual annual quantities harvested and direct use values per household of selected edible and medicinal NTFPs. Some households extract fewer edible NTFPs compared to other households, particularly those that have reliable food aid programmes in the Shewula area in the Lubombo plateau. Some households extracted fewer medicinal NTFPs, particularly those that have easy access to modern medicines in the Siphofaneni area in the Lowveld. Households with a large number of unemployed members rely more heavily on NTFPs for medicines, foods, as well as rural household income than those with employed members. This was shown by the fact that reliance on NTFPs is low in the Shewula area where more household members are employed. Considering that over 70% of the population of Swaziland falls within rural poor (the unemployed), then the reliance on NTFPs is a huge subsidy to the Swaziland Government, as alluded to by Shackleton and Shackleton (2004) in the Republic of South Africa.

Government should take a leading role in formulation, design, development and implementation of local and national level projects and programmes for the sustainable management and development of NTFPs, as suggested by Shackleton and Shackleton (2004) for South Africa. The results of this study show annual direct use values per household that are comparable to those reported by Hedge *et al.* (1996) from the Soliga households in India, and High and Shackleton (2000) and Shackleton *et al.* (2002) from South African rural households.

The NTFPs resource assessment and economic valuation in this study is a genesis of NTFPs inventory and valuation in Swaziland. This will forever be a benchmark for future NTFPs resource assessments and valuation studies. The previous GTZ national forest inventory of

1990 and the DANCED forest resource assessment of 1999 focused mainly on the distribution of woody species and there was no economic valuation at all. The sampling method used in this study yielded higher inventory values compared to the NTFPs inventory studies by Peters *et al*. (1989) in the Amazonian rainforests, Balick and Mendelson (1992) in the Tropical forests and Robles-Diaz-De-Leon and Kangas (1999) in Maryland. The other reason for this, besides differences in forest types and species composition, could be that this study engaged smaller stratified sampling plots of 50 m x 50 m (smaller than the conventional 1 ha), in order to include all the plant growth forms (trees, small tress, shrubs and under-story). Most of the other studies targeted only a certain growth form (eg. trees, excluding shrubs and under-storey individuals).

The assessment of NTFPs species distribution and estimation of the inventory values of the standing stock of NTFPs in the nominated natural forests and woodlands, showed the economic value of the selected NTFPs. These values are relatively high despite the fast disappearance and extinction of top priority species as shown by the results of the inventory in Chapter 6. The increased demand for NTFPs may result in uncontrolled over exploitation of NTFPs, leading to accelerated deforestation and immense forest degradation leading to disappearance and extinction of important NTFPs species in future. Similar findings were gathered by Shackleton and Shackleton (2000) that extraction rates of several secondary forest resources are sustainable but not for more important or preferred ones like fuelwood, construction wood and medicinal plants. An Action programme for the rehabilitation of degraded forests and jungles is highly necessary, as part of the new National Forest Action Programme, to combat this potential environmental catastrophe.

7.2 CORE ISSUE AND RECOMMENDATIONS FOR THE IMPROVEMENT OF THE NTFP SECTOR

Based on the findings of this study and previous studies, cited in the text, on the sustainable management of NTFPs, three broad issues were identified and a set of recommendations were made. These issues and recommendations are outlined below.

1. *Issue*: There is a lack of information necessary to realize the full benefits of NTFPs for individual, community and national well-being. Decision-makers, forest managers and resource users alike lack information about economic, ecological and social characteristics of NTFPs and their uses.

Recommendations: Government efforts should be strengthened to conduct research. The generated information and statistics should be compiled and disseminated to key stakeholders

on NTFPs resources and their socio-economic and ecological values. Also, Government and development agencies should support education and public awareness programmes for NTFPs conservation and sustainable use.

2. *Issue*: The current lack of protected rights to access and benefit from NTFPs resources can adversely affect their conservation and sustainable use and discourage investment in the resource.

Recommendations: Government, with assistance from concerned agencies and organizations, should i) develop and implement policies and legislation to provide secure access and benefits for the people whose livelihoods are dependent on or supplemented by NTFPs; and ii) ensure that stakeholders, particularly collectors, growers and traders are provided incentives to sustainably manage NTFPs resources.

3. *Issue*: Individuals, communities and institutions generally lack the technical, financial, political and social capacity to influence policies and generate information necessary to manage and monitor NTFPs resources effectively.

Recommendations: Government, with assistance from concerned agencies and organizations, should support programmes and projects to build individual, institutional and community-based capacity to manage NTFPs through active participation of stakeholders. Government and research agencies should give priority to research and the development and dissemination of management practices to be integrated into multi-purpose forest and agro-forestry resource management.

7.3 KEY ASPECTS OF SUSTAINABLE RESOURCE USE

In order to effectively address the above issues and implement the suggested recommendations certain aspects of sustainable resource use should be recognized. These were adopted and modified from Lamb (1983), Falconer (1992), UNEP (1992a), FAO (1995, 2001, 2003a,b), Crafter *et al*. (1997), Bhattarai and Hammig (1998), DANCED (2000b, 2001), GOS (1999), Mogaka *et al*. (2001), Barrow *et al.* (2002), Geldehuys (2002, 2003, 2004), Hassan *et al*. (2002), Clarke and Grundy (2004), Lawes *et al.* (2004), Shackleton and Shackleton (2004, 2005), Janse and Ottisch (2005), Emanuel *et al*. (2005) and Olsen (2005).

These are highlighted below:

1. Sustainability is the basic framework for forest management, and has four key components, namely ecological, social, economical and legal. The process towards sustainable forest management for resource use involves some crucial elements or components, which need to be addressed.

2. Biodiversity: As described in Article 2 of the CBD, biodiversity is defined as the variability amongst living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems. Sustainable resource use should encompass the conservation and rational use of forest biodiversity within which NTFPs exist;

3. Forest characteristics: the functional and structural characteristics of a forest is described in terms of the growth and life forms of plants, and they include plants with woody and non-woody stems, such as trees, small trees, shrubs and understory individuals. In this case most NTFPs are harvested from trees, shrubs and understory plants, and as such forests and woodlands composed of a vast array of these plants are likely to house a variety of useful NTFPs that contribute to the livelihoods of the local people.

4. Forest types: the functional and structural characteristics of plants combined with the dominant species can be used to describe a specific forest and distinguish one type of forest from another. This distinction is based on key species, resource use potential and resilience to resource use. Hence the various forest strata of Swaziland highlighted in chapter one indicated a broad spectrum of plants ranging from trees to shrubs to understory herbs.

5. Ecological processes of disturbance and recovery: Natural disturbance and recovery processes shape each specific forest type towards a characteristic floristic and structural composition. As a consequence of human interferences due to collection of products or land clearing for agriculture the natural/forest environment is disturbed to various degrees. These disturbances can be a disaster, can be within the adaptations and tolerance limits of the forest, or it can have no effect on the natural disturbance and recovery processes of forests. Unsustainable NTFPs harvesting methods such as overexploitation of natural forests and woodlands, where the demand supercedes the supply, can have a detrimental effect on the ecological processes (i.e. recovery processes of the forest) thereby leading to accelerated forest degradation.

Management systems need to be designed to incorporate the natural disturbance and recovery processes characteristic of each specific forest type.

6. Matching forest resource availability with use demands: it is imperative that forest uses, public demands and management practices have to adequately match the available forest resource. This should take into consideration the characteristics of the forests and the key species and those targeted for use. This serves as a basis of sustainable forest management policies, strategies and practices and as such sustainable forest resource use. It is also important to differentiate between ecological and economic sustainability.

7. Conservation of forests: Swaziland, like all other SADC states, has a national and international obligation to protect tree species under threat as presented in the Red Data List of Swaziland plants. The IUCN has developed broad protected area management categories which are internationally recognized and which offer various levels of protection to natural forests and woodlands. Within the Swaziland forestry and environment sectors natural forests and woodlands are divided into protection worthy areas that need immediate attention (i.e. need to be declared and gazetted) but still consider granting permission to local communities to harvest NTFPs under stipulated conditions;

8. Forest products and services: As shown in chapter 3, the natural forests and woodlands offer a vast array of goods and services that provide unique socio-economic and ecological benefits. Forests and forestlands provide foods, medicines, fuelwood, and many more products and environmental services. This makes forests and related ecosystems to be a source of income and employment to adjacent rural communities and this enhances rural economic development that comes as a significant susbsidy to government. This is in the context of forest economics and not biodiversity per se. This study and previous studies have thus far accepted the basic concept of economic valuation studies as a basis for examining land use decisions of local peoples (Sheil and Wunder, 2002).

9. Participatory approaches: thorough consultations and participation of a broad all-encompassing range of stakeholders is the corner stone of sustainable forest management. For example, local resource users may provide high profile information on the forest biodiversity, and past and existing management protocols as shown in chapter 4. The involvement of all stakeholders in the implementation of national

criteria and indicators for sustainable forest management is crucial for long-term forest management and sustainability.

10. Forest resource inventory/survey: in order to develop sustainable harvesting practices, the forest characteristics and resource use requirements must be established. This is accomplished through resource inventory and surveys that will provide information to effectively match the resource users' needs with the available resources;

11. Yield regulation: this is a mechanism where an equilibrium is maintained between resource demand and resource supply. As a result of this equilibrium, environmental, social and economic sustainability are maintained into the future;

12. Planning for forest resource management: the following documents are pertinent and essential in natural resources management planning and control: policies and strategies, management plans, annual operational plans, and work plans.

7.4 RECOMMENDED THEORETICAL FRAMEWORK FOR THE SUSTAINABLE MANAGEMENT OF NTFPs

As stated earlier, based on the above findings, this study ultimately makes recommendations for a framework for the formulation and development of a concept for the sustainable management and development of NTFPs in the four ecological zones of Swaziland. This concept can be modified and adopted to various local situations at various regional and international levels. The theoretical framework should consider the following essential factors:

1. Economic aspects of community involvement in sustainable forest management;
2. Value, use and management of NTFPs at local and national levels;
3. Techniques and principles of sustainable management of natural forests and woodlands;
4. The role of NTFPs in rural income and sustainable forestry;
5. Analysis of stakeholder power and responsibilities in community involvement in sustainable forest management;
6. Research on the following issues:
   - 6.1 Status of the NTFP sector
   - 6.2 Review of the impact of policy and legislation on NTFPs
   - 6.3 Community consultations on NTFPs resource use and management
   - 6.4 User surveys and economic valuation

6.5 Resource surveys and economic valuation

7. Define the role of government, NGO's, private sector, development agencies and local communities in the development of NTFPs
8. Contemporary and innovative approaches towards the development of sustainable resource use of NTFPs;
9. National level Criteria and Indicators for Sustainable Forest Management.

The framework of this concept should be based on a series of major strategies as highlighted in the next section and illustrated in Figure 7.1.

Strategy 1: Information and social communication

Issue

There is a serious element of information gap on NTFPs at the local and national levels. Information on the roles, values and conservation of NTFPs is not exchanged between resource users.

Recommendation

Mechanisms to generate all the necessary information need to be established to reflect the multi-dimensions of the NTFP sector with respect to environmental, ecological, social, cultural, and economic implications regarding the direct and indirect use benefits and intermediate use services. This will rectify the profound lack of information on NTFPs that has lead to their detriment regardless of their actual value in local and national economies. A similar recommendation was made in the Quebec Declaration at The XII World Forestry Congress Side Event on NTFPs (FAO, 2003a). Already some countries in the SADC have established rural information centers were different communities can exchange information on various aspects in the NTFP sector. This would be a milestone in addressing this information gap.

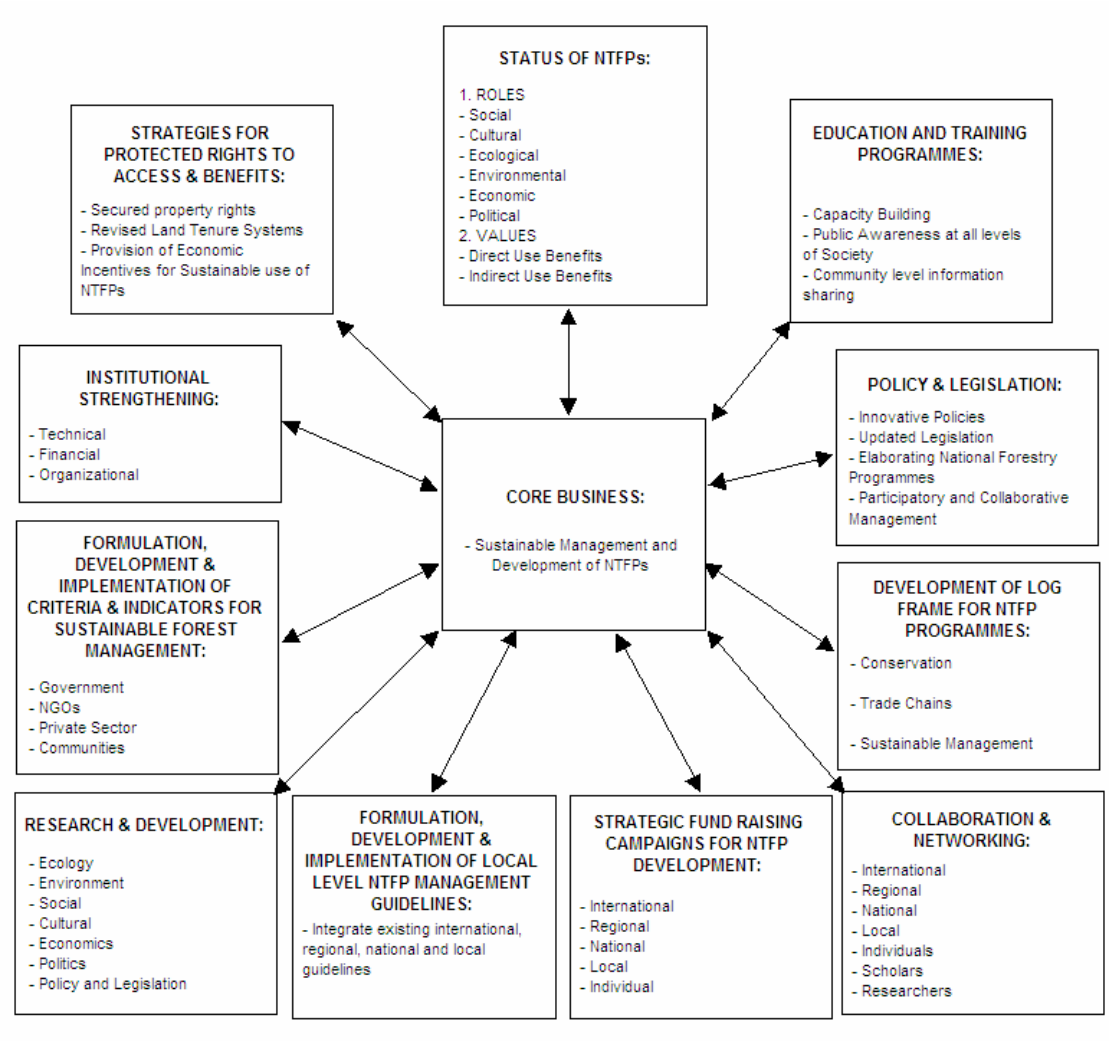

Figure 7.1: Schematic Presentation of the Key Elements in the Sustainable Management and Development of NTFPs

Strategy 2: Secure rights and access to NTFPs and related resources

Issue

There are no secure rights to access and benefits from NTFPs for local resource users and this result in intruders and non resident collectors invading NTFPs and promoting unsustainable utilization of NTFPs.

Recommendation

Develop strategies for protected rights to access and benefits from natural forests and woodlands. These should be secure property rights, including established boundaries and

clear membership to enhance management and use incentives to conserve NTFPs. Similar recommendations were made by the UNEP (1992a), Crafter *et al.* (1997), Mogaka *et al.* (2001) and Barrow *et al.* (2002).

Strategy 3: Adoption of innovative forest policy and legislation

Issue

National policies and legislation are obsolete and fragmented and as a result they remain ineffective in their role in sustainable resource use at the local and national levels.

Recommendation

Innovative policies need to be adopted, legislation need to be revised and updated and national forestry programmes need to be elaborated. National forest policies and forest laws should encourage collaborative management of forest resources; where plurastic view of NTFPs between the Government Forest Department and local communities will be reconciled and viable institutional strengthening will be facilitated. This will enhance the implementation of national and international policies and legislation. These should empower communities to be able to control and use their resources and they should facilitate the emergence of functional village level or local level resource management capacity. Similarly, Crafter *et al*. (1997) and FAO (2003a) recommended adoption of innovative policies and legislation in the sustainable management of NTFPs. New policies should also recognise the application of a regional approach to conservation of the species and improvement of official trade monitoring by governments (Olsen, 2005).

Strategy 4: Develop and implement appropriate Criteria and Indicators for Sustainable Forest Management

Issue

Criteria and indicators for sustainable forest management are a major area of concern for sustainable resource use

Recommendation

Development and implementation of local-level National Criteria and Indicators for Sustainable Forest Management is crucial. The national criteria and indicators should cover the following areas, in order to comply with international standards:

1. Development, maintenance and improvement of forest resources;
2. Conservation and enhancement of biological diversity in forest ecosystems;
3. Maintenance and enhancement of forest ecosystem health, vitality and integrity;
4. Maintenance and enhancement of productive functions of forests and other wooded land;
5. Maintenance and improvement of environmental and conservation functions of forests and other wooded lands and combating land degradation;
6. Maintenance and enhancement of socio-economic benefits of forests and other wooded lands;
7. Adequacy and effectiveness of legal, institutional and policy frameworks for sustainable forest management

Identification of the relevant key stakeholders, including those from government, private sector, NGO's and Communities for indicator monitoring is crucial for the successful implementation process of the criteria and indicators.

Strategy 5: Project planning and control techniques in NTFPs development and conservation programmes

Issue

The logical framework approach to project management is totally lacking in the NTFP sector and thus planning and control of projects and programmes for the development of NTFPs may be done with great difficulty.

Recommendation

A short, medium and long-term logical framework needs to be formulated and developed for all local and national projects and programmes on development of NTFPs. This should entail a narrative summary of i) the overall objective, ii) the various sub-programmes with clear objectives and activities under each sub-programme with clear outputs and outcomes, and inputs required for each sub-programme, iii) statement of objectively verifiable indicators,

means of verification and critical assumptions for the overall objective and the sub-programmes and specific activities. This would constitute a good proposal for funding and a tool for project implementation and monitoring. Such NTFPs development projects should include small processing industries for value adding and plant domestication and commercialization projects. It is essential that there is an effective monitoring and evaluation system in all projects because this not only asseses impact but also allows project managers and beneficiaries to develop best practices for future use.

Strategy 6: Local-level guidelines for Sustainable NTFPs management

Issue

Absence of traditional management programmes for NTFPs is a major concern for rural communities since decentralization of power (from central government to communities) requires participation of traditional authorities

Recommendation

Sound local-level guidelines need to be formulated and developed for sustainable NTFPs management. Regardless of the absence of traditional NTFPs management systems the local communities (through community consultations) can still raise pertinent and key issues on a SWOT analysis of the present situation on the status of sustainable NTFPs management.

The integration of these issues into the relevant national, regional and international guidelines for sustainable use of NTFPs can yield good local-level management plans for implementation. These guidelines should be in line with existing national policies, national forestry programmes and legislation, such as the National Forestry Act.

Strategy 7: Institutional linkages and net-working

Issue

Profound lack of collaboration and networking between stakeholders in NTFPs issues is a drawback in efforts towards sustainable resource use. Often NTFPs issues are not coordinated and this leads to duplication of work and a waste of resources.

Recommendation

Building a culture of collaboration and networking between all institutions involved in the use and management of NTFPs should be ensured. These would include individuals, communities, researchers, scholars, diverse government departments, NGO's, development agencies, private sector and other stakeholders. Coordination of activities, research initiatives, findings and sharing of experiences would greatly improve the successes of efforts towards NTFPs development. A similar recommendation was made by the UNEP (1992a) with regard to the sustainable use and management of biodiversity.

Strategy 8: Conservation and development financing mechanisms

Issue

Initiatives for the funding of the development of NTFPs are totally absent and this hinders the development of the NTFP sector

Recommendation

Strategic fund raising campaigns need to be established for the sustainable management and conservation of NTFPs. In most cases, NTFPs conservation programmes and initiatives are jeopardized by lack of funds. With proper financial back up the future of the NTFP sector is guaranteed. Fundraising campaigns should be done at the local, national, regional and international levels.

Strategy 9: Institutional strengthening and capacity building

Issue

Institutions dealing with NTFPs and related resources currently lack the necessary capacity to effectively implement sustainable management programmes

Recommendation

Institutional Strengthening and Capacity Building are imperative in sustainable management of natural resources, including NTFPs, and this should be done from local level. If

institutional reform/strengthening is done at local level, chances of having more successful and sustainable management strategies are higher. It therefore becomes important too that the financial, technical, economic, ecological, legislative, policy and political capacities of local institutions engaged in the sustainable development of NTFPs are enhanced.

Strategy 10: Education and training on NTFPs

Issue

Awareness programmes and education and training on importance of NTFPs are missing at all levels of society

Recommendation

Education and Training should be done on the roles, values, dynamics, sustainable management and development of NTFPs at all levels of social structures in all communities. Local and national level training programmes should be launched starting from decision-makers to ordinary citizens. The youth should also be involved as well as traditional leaders, traditional healers and local collectors and traders of NTFPs.

Strategy 11: Research and development

Issue

Quantitative statistical data on the status of NTFPs is lacking and as such it is difficult to make informed decisions on the conservation and sustainable use of these resources

Recommendation

Government, NGO's, the private sector, communties, research institutions, institutions of higher learning and other interested organisations and individuals should embark on information gathering studies to capture the multi-dimensional value of NTFPs. In turn this information should be disseminated to all stakeholders. This will enable society to have a clear picture of the direct, indirect and intermediate goods and services of the NTFP sector and develop interest in the siustainable management and development of NTFPs. Research can also be done on sustainable natural forest management through scientific understanding of

the dynamics of trees and plants. Such research should include periodical forest resource assessments and natural resource and environmental accounting for NTFPs.

The above sequence of strategies that form the theoretical framework for sustainable resource use may not be the best option but it is a building block to which future concepts and strategies will refer. It may not be the answer to all the challenges of sustainable NTFPs management but it is multi-dimensional and pragmatic and open to improvement.

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APPENDIX 1

The eight main groups of forest types and their various strata in Swaziland

GTZ classification (1990)	Re-classified broad groups (1999)	Re-classified sub-groups (1999)	Characteristics	Area Covered (ha)-1999 >0.5 ha	Annual Volume Increment (M^3/ha)-1990	Regeneration (plants/ha)-1999
STRATUM 1						
Montane and Highland	Montane and Highland	Dense Montane	>900m, Afromontane and mixed woodland, >60% canopy cover, Highveld/Upper Middleveld	10,510	1.0	8,577
		Open Montane	>900 m, Afromontane and mixed woodland, >10-60% canopy cover, Highveld/Upper Middleveld	839		
STRATUM 2						
Riparian	Riverine forest	Riverine forest	Mixed woodland occurring along rivers, all physiographic zones	25,207	1.5	3,979
STRATUM 3						
Moisture savanna	Mixed woodland	Dense mixed woodland	400-800 m, mainly broadleaved mixed woodland, >60% canopy cover, Middleveld/Lubombo range	52,971	1.0	4,270

GTZ classification (1990)	Re-classified broad groups (1999)	Re-classified sub-groups (1999)	Characteristics	Area Covered (ha)-1999 >0.5 ha	Annual Volume Increment (M^3/ha)-1990	Regeneration (plants/ha)-1999
		Open mixed woodland	400-800 m, mainly broadleaved mixed woodland, >10-60% canopy cover, Middleveld/Lubombo range	116,649		
STRATUM 4						
Acacia savanna	Acacia woodland	Dense Acacia woodland	200-400 m, Acacia dominated woodland, >60% canopy cover, Lowveld	10,293	0.7	1,507
		Open Acacia woodland	200-400m, Acacia dominated woodland, >10%-60% canopy cover, Lowveld	168,028		
STRATUM 5						
Dry Acacia savanna	Dry Acacia woodland	Dense Dry Acacia woodland	200-400 m, Acacia dominated woodland, >60% canopy cover, >5 m canopy height, (East) Lowveld, precipitation <600 mm	1,482	0.2	2,759
		Open Dry Acacia woodland	200-400 m, Acacia dominated woodland, >10-60% canopy cover, >5 m canopy height, (East) Lowveld, precipitation <600 mm	32,846		
STRATUM 6						

GTZ classification (1990)	Re-classified broad groups (1999)	Re-classified sub-groups (1999)	Characteristics	Area Covered (ha)-1999 >0.5 ha	Annual Volume Increment (M^3/ha)-1990	Regeneration (plants/ha)-1999
Bushveld	Indigenous Bushveld	Dense Bushveld	200-400 m, bush/thicket communities, >60% canopy cover, <5 m canopy height, Lowveld to Highveld	55,683	0.2	1,905
		Open Bushveld	200-400 m, bush/thicket communities, >10-60% canopy cover, <5 m canopy height, Lowveld to Highveld	177,271		
STRATUM 7						
Wattle forests	Wattle forests	Wattle forests	Highveld, *Acacia mearnsii* dominated forests	26,440	8.7	9,166
STRATUM 8						
Plantations	Plantations	Plantations	Man-made plantations of pines and eucalyptus (mainly Highveld)	110,222	16.0	

Source: Modified from Hess et al., 1990 and Danced 1999

APPENDIX 2

NATIONAL FOREST INVENTORIES-SPECIES DISTRIBUTION OVER THE VARIOUS FOREST TYPES OF SWAZILAND (Hess *et al*, 1990 and DANCED, 1999).

Stratum	Botanical Name	Stem diameter class, cm							
		5-9	10-14	15-19	20-24	25-29	30-34	35-39	>=40
Montane & Highland	*Acacia ataxacantha*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Acacia mearnsii*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Acacia species (Other)*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Combretum species*	3.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Montane & Highland	*Erythrina lysistemon*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Euclea species*	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Gardenia cornuta*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Heteropyxis natalensis*	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Montane & Highland	*Ilex mitis*	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Maesa lanceolata*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Psidium guajava*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Psychotria capensis*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Ptaeroxylon obliquum*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Syzygium species*	1.0	1.0	4.0	3.0	0.0	0.0	0.0	0.0
Montane & Highland	*Capparis tomentosa*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Acacia nigrescens*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Riparian	*Clerodendrum species*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Combretum species*	0.0	3.0	2.0	3.0	0.0	0.0	0.0	0.0
Riparian	*Erythrina lysistemon*	0.0	3.0	1.0	1.0	0.0	3.0	0.0	0.0
Riparian	*Ficus species*	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0
Riparian	*Peltophorum africanum*	1.0	1.0	1.0	2.0	0.0	0.0	0.0	0.0
Riparian	*Pterocarpus angolensis*	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Riparian	*Rapanea melanophoeos*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Sclerocarya birrea*	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0
Riparian	*Spirostachys africana*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Zizyphus mucronata*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia ataxacantha*	6.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia davyi*	1.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia karroo*	12.0	4.0	3.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia mearnsii*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia nigrescens*	11.0	16.0	12.0	6.0	5.0	4.0	1.0	2.0
Moister Savanna	*Acacia nilotica*	8.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia tortilis*	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia species (Other)*	5.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Agapanthus species*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Albizia versicolor*	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Moister Savanna	*Aloe species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Annona senegalensis*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Antidesma venosum*	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Bauhinia species*	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Englerophytum natalense*	0.0	3.0	2.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Berchemia zeyheri*	9.0	7.0	5.0	2.0	1.0	1.0	0.0	1.0
Moister Savanna	*Bolusanthus speciosus*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Brachylaena species*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Bridelia micrantha*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Canthium species*	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Cassine species*	5.0	5.0	2.0	2.0	0.0	0.0	0.0	0.0
Moister Savanna	*Celtis africana*	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Combretum species*	57.0	58.0	36.0	20.0	9.0	3.0	1.0	2.0

Stratum	Botanical Name	Stem diameter class, cm							
		5-9	10-14	15-19	20-24	25-29	30-34	35-39	>=40
Moister Savanna	*Curtisia dentate*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Acacia ataxacantha*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Acacia mearnsii*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Acacia species (Other)*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Combretum species*	3.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Montane & Highland	*Erythrina lysistemon*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Euclea species*	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Gardenia cornuta*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Heteropyxis natalensis*	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Montane & Highland	*Ilex mitis*	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Maesa lanceolata*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Psidium guajava*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Psychotria capensis*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Ptearoxlyon obliquum*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Montane & Highland	*Syzygium species*	1.0	1.0	4.0	3.0	0.0	0.0	0.0	0.0
Montane & Highland	*Capparis tomentosa*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Acacia nigrescens*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Riparian	*Clerodendrum species*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Combretum species*	0.0	3.0	2.0	3.0	0.0	0.0	0.0	0.0
Riparian	*Erythrina lysistemon*	0.0	3.0	1.0	1.0	0.0	3.0	0.0	0.0
Riparian	*Ficus species*	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0
Riparian	*Peltophorum africanum*	1.0	1.0	1.0	2.0	0.0	0.0	0.0	0.0
Riparian	*Pterocarpus angolensis*	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
Riparian	*Rapanea melanophoeos*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Sclerocarya birrea*	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0
Riparian	*Spirostachys africana*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	*Zizyphus mucronata*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia ataxacantha*	6.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia davyi*	1.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia karroo*	12.0	4.0	3.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia mearnsii*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia nigrescens*	11.0	16.0	12.0	6.0	5.0	4.0	1.0	2.0
Moister Savanna	*Acacia nilotica*	8.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia tortilis*	3.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Acacia species (Other)*	5.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Agapanthus species*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Albizia versicolor*	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Moister Savanna	*Aloe species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Annona senegalensis*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Antidesma venosum*	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Bauhinia species*	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Englerophytum natalense*	0.0	3.0	2.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Berchemia zeyheri*	9.0	7.0	5.0	2.0	1.0	1.0	0.0	1.0
Moister Savanna	*Bolusanthus speciosus*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Brachylaena species*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Bridelia micrantha*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Canthium species*	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Cassine species*	5.0	5.0	2.0	2.0	0.0	0.0	0.0	0.0
Moister Savanna	*Celtis africana*	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Combretum species*	57.0	58.0	36.0	20.0	9.0	3.0	1.0	2.0
Moister Savanna	*Curtisia dentate*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Cussonia species*	1.0	1.0	2.0	3.0	2.0	1.0	1.0	0.0
Moister Savanna	*Dichrostachys cinerea subsp. africana*	5.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0

Stratum	Botanical Name	Stem diameter class, cm							
		5-9	10-14	15-19	20-24	25-29	30-34	35-39	>=40
Moister Savanna	Diospyros species	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Dombeya rotundifolia*	10.0	1.0	2.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Ekebergia capensis*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Erythrina lysistemon*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Euclea species*	9.0	3.0	2.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Euphorbia tirucalli*	0.0	7.0	3.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Fagara species*	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Faurea species*	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Ficus species*	1.0	2.0	2.0	2.0	3.0	1.0	0.0	0.0
Moister Savanna	*Gardenia cornuta*	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Halleria lucida*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Heteropyxis natalensis*	16.0	8.0	5.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Ilex mitis*	6.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Kraussia floribunda*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Maesa lanceolata*	2.0	1.0	3.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Maytenus species*	6.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Olea africana*	5.0	3.0	4.0	0.0	0.0	2.0	1.0	0.0
Moister Savanna	*Ozoroa species*	0.0	0.0	1.0	3.0	2.0	0.0	0.0	0.0
Moister Savanna	*Pappea capensis*	0.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0
Moister Savanna	*Peltophorum africanum*	9.0	12.0	3.0	2.0	1.0	0.0	0.0	1.0
Moister Savanna	*Pterocarpus angolensis*	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
Moister Savanna	*Pterocarpus rotundifolius*	4.0	8.0	2.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Rapanea melanophoeos*	1.0	4.0	2.0	1.0	1.0	0.0	0.0	0.0
Moister Savanna	*Rhus species*	5.0	3.0	1.0	0.0	1.0	0.0	0.0	0.0
Moister Savanna	*Rothmania species*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Schotia brachypetala*	0.0	2.0	4.0	0.0	1.0	0.0	0.0	0.0
Moister Savanna	*Sclerocarya birrea*	2.0	2.0	2.0	0.0	2.0	0.0	2.0	5.0
Moister Savanna	*Spirostachys africana*	6.0	7.0	2.0	0.0	2.0	1.0	1.0	0.0
Moister Savanna	*Strychnos species*	3.0	7.0	1.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Syzygium species*	3.0	1.0	2.0	3.0	2.0	0.0	0.0	3.0
Moister Savanna	*Terminalia species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Trichilia emetica*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Trimeria grandifolia*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Vangueria infausta*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Vitex species*	3.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0
Moister Savanna	*Zizyphus mucronata*	11.0	4.0	3.0	4.0	3.0	1.0	2.0	0.0
Moister Savanna	*Unidentified species*	5.0	6.0	2.0	0.0	1.0	0.0	0.0	1.0
Moister Savanna	*Allophylos africanus*	10.0	3.0	1.0	1.0	0.0	0.0	0.0	0.0
Moister Savanna	*Datura stramonium*	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Moister Savanna	*Gymnosporia heterophylla*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Acacia ataxacantha*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Acacia burkei*	1.0	2.0	0.0	1.0	0.0	1.0	0.0	0.0
Acacia Savanna	*Acacia karroo*	37.0	42.0	7.0	5.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Acacia nigrescens*	20.0	19.0	17.0	12.0	7.0	7.0	3.0	2.0
Acacia Savanna	*Acacia nilotica*	4.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Acacia senegal*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Acacia tortilis*	5.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0
Acacia Savanna	*Cassine species*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Acacia Savanna	*Combretum species*	12.0	6.0	5.0	5.0	1.0	0.0	1.0	0.0
Acacia Savanna	*Dichrostachys cinerea subsp. nyassana*	11.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Encephalartos specie*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Stratum	Botanical Name	Stem diameter class, cm							
		5-9	10-14	15-19	20-24	25-29	30-34	35-39	>=40
Acacia Savanna	*Euclea species*	1.0	1.0	0.0	2.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Lannea discolor*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Pappea capensis*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Peltophorum africanum*	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Plectroniella armata*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	*Pterocarpus rotundifolius*	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0
Acacia Savanna	Schotia brachypetala	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Acacia Savanna	*Sclerocarya birrea*	0.0	0.0	2.0	0.0	0.0	1.0	1.0	2.0
Acacia Savanna	*Spirostachys africana*	4.0	3.0	0.0	0.0	0.0	1.0	0.0	1.0
Acacia Savanna	*Strychnos species*	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0
Acacia Savanna	*Zizyphus mucronata*	8.0	9.0	4.0	2.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Acacia karroo*	13.0	5.0	1.0	0.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Acacia nigrescens*	0.0	10.0	5.0	3.0	1.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Acacia senegal*	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Acacia tortilis*	6.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Dichrostachys cinerea subsp. nyassana*	3.0	3.0	2.0	0.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Sclerocarya birrea*	0.0	0.0	0.0	2.0	1.0	2.0	1.0	1.0
Dryer Acacia Savanna	*Unidentified species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Dryer Acacia Savanna	*Acacia polyacantha*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Acacia ataxacantha*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Acacia karroo*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Acacia mearnsii*	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
Bushveld	*Acacia nigrescens*	8.0	1.0	0.0	0.0	2.0	1.0	1.0	0.0
Bushveld	*Berchemia zeyheri*	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Bushveld	*Cassine species*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Combretum species*	2.0	15.0	5.0	2.0	0.0	3.0	0.0	0.0
Bushveld	*Dichrostachys cinerea subsp. nyassana*	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Erythrina lysistemon*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Euclea species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Heteropyxis natalensis*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Ilex mitis*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Maytenus species*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Peltophorum africanum*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Psidium guajava*	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Pterocarpus rotundifolius*	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0
Bushveld	*Rhus species*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Sclerocarya birrea*	0.0	1.0	0.0	0.0	0.0	1.0	1.0	1.0
Bushveld	*Strychnos species*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Syzygium species*	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Vangueria infausta*	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Zizyphus mucronata*	1.0	3.0	1.0	5.0	2.0	0.0	0.0	1.0
Bushveld	*Unidentified species*	15.0	2.0	3.0	2.0	0.0	0.0	0.0	0.0
Bushveld	*Adina microcephala*	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Allophylos africanus*	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Bushveld	*Philenoptera violacea*	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Wattle Forests	*Acacia mearnsii*	56.0	37.0	7.0	2.0	1.0	1.0	0.0	0.0
Wattle Forests	*Clerodendrum species*	1.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0
Wattle Forests	*Diospyros species*	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wattle Forests	*Ficus species*	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
Wattle Forests	*Peltophorum africanum*	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 3

National level Criteria and Indicators for Sustainable Forests Management

Criterion 1

Development, maintenance and improvement of forest resources including their contribution to Global Carbon cycles

Indicators

- ✓ Total areas of natural forests, plantations, other wooded lands (and their change over time)
- ✓ Biomass (and its change over time)

Criterion 2

Conservation and enhancement of biodiversity in forest ecosystems

Indicators

Ecosystem:

- ✓ Areas by types of vegetation
- ✓ Extent of protected areas
- ✓ Conservation areas outside protected areas
- ✓ Area lost annually of forest ecosystem with endemic species
- ✓ Reintroduction of locally extinct forest species

Species:

- ✓ Number of forest-dependent species (and its change over time)
- ✓ Number of forest-dependent species at risk
- ✓ Resource exploitation system used

Genetic:

- ✓ Average number of provenance (and its change over time)
- ✓ Number of forest-dependent species with reduced range
- ✓ Population levels of key species across range
- ✓ Number of genetically modified organisms in the forest
- ✓ Degree of management of genetic resources

Criterion 3

Maintenance and enhancement of forest ecosystem health, vitality and integrity

Indicators

- ✓ Areas and % of forest (natural and man-made) modified, with the indication of severity of damage by such agents as fires, storms, insects and diseases, damage by animals, drought, damage by wind erosion, earthquakes and landslides
- ✓ Percentage of forest ecosystems with or without regeneration
- ✓ Changes in soil fertility
- ✓ Encroachment by invasive plants
- ✓ Trends in yield of forests and agricultural produce
- ✓ Percentage of forest area encroached by human activities

Criterion 4

Maintenance and enhancement of productive functions of forests and other woodlands

Indicators

- ✓ Percentage of forests/other wooded land managed according to a management plan
- ✓ Growing stock
- ✓ Periodical balance between growth and removal of wood products
- ✓ Average annual consumption of wood for energy/capita
- ✓ Management and sustainable extraction of NTFP's of: fodder, bush meat, honey, gum, fruits, roots, edible leaves, mushrooms, medicinal substances, fibres for handicrafts and other uses
- ✓ Are under agro-forestry practices

Criterion 5

Maintenance and improvement of environmental and conservation functions of forests and other wooded land and combating land degradation and desertification

Indicators

- ✓ Areas and % of forests and other wooded land managed for the protection and rehabilitation of agricultural and range lands and/or rehabilitation of degraded lands and/or areas prone to desertification and relevant infrastructure works
- ✓ Areas and % of forests and other wooded land mainly for the production of water, protection of water sheds, riverine zones and flood control
- ✓ Change in water yield and quality
- ✓ Areas of forests and other wooded land managed for scenic and amenity purposes (eco-tourism)
- ✓ Areas which have obtained an Environmental Compliance Certificate (ECC)
- ✓ Changes in soil quality

Criterion 6

Maintenance and enhancement of socio-economic benefits of forests and other wooded land

Indicators

- ✓ Value of wood products
- ✓ Value of NWFP's and NTFP's
- ✓ Value of eco-tourism
- ✓ Value of primary and secondary industries
- ✓ Share of forests in GDP
- ✓ Value of biomass energy in rural areas and urban areas
- ✓ Investment in forests and forest industries including the informal sector
- ✓ Number of people employed in the forestry sector
- ✓ Degree to which social, cultural, historical, spiritual and aesthetic values and needs are met
- ✓ Benefits to the disadvantaged communities
- ✓ Contribution to food security
- ✓ Wood and NWFP's/NTFP's trade balance

Criterion 7

Adequacy and effectiveness of legal, institutional and policy frameworks for sustainable forest management

Indicators

- ✓ Existence of a National Forest Policy in harmony with other sectoral policies
- ✓ Existence of comprehensive legislation and regulatory framework providing access to resources, alternative forms of conflict resolution and consideration of land occupancy and cultural rights of local populations
- ✓ Existence of institutional, human and financial capacity to implement the National Forest Policy and relevant national and international laws, instruments and regulations
- ✓ Existence of coordinated research and development
- ✓ Existence of monetary and non-monetary incentives for investment in the forestry sector
- ✓ Value of local expertise, knowledge and technologies
- ✓ Existence of measures to facilitate the transfer and adaptation of appropriate technologies
- ✓ Existence of administration, policy and legal framework for effective participation of all stakeholders i.e. government, local communities, NGO's and the private sector in policy formulation, implementation and monitoring
- ✓ Existence of regulatory framework for the regulation of GMO's

Source: GOS, 2002b.

APPENDIX 4

Guidelines for local-level sustainable forest management suggested at Community Consultation Meetings

Issues raised (by the community representatives) in the various study sites during community consultation meetings

Highveld: Hhelehhele North (August 2003, September, 2003)

- Establishment of community-based Natural Resource Management Committees working with the traditional authorities in the regulating and monitoring the harvesting of forest products
- Formulation and implementation of a national strategy for Alien Invasive Plants (AIP)
- Empowerment of Chiefs and their Inner Council in natural resources management and support of the communities is pivotal
- Control of Forest Fires, by enforcing the Law
- Species reintroduction and replanting programmes for lost species and species high socio-economic value
- The national policies and legislation governing the use of natural resources such as forests and woodlands should be brought to the people, though there policies and laws in existence the local communities are not well versed about them
- Conversation from exotic tree species like *Eucalyptus species* to appropriate natural/indigenous species, in fear that exotic species are heavy drinkers and not multi-purpose
- Legislation must force community meetings on natural resources management, so that no one is left out, currently people absent themselves from meetings at their own will and there is no way to stop this unbecoming behaviour
- Establishment of community-based forest reserves would save the natural forests and woodlands
- Establishment and management of protected clonal and seedling seed orchards

Middleveld: Grand Valley/Ka Kholwane (August 2003, September, 2003)

- Establishment of community-based Natural Resource Management Committees working with the traditional authorities in regulating and monitoring the harvesting of forest products
- Formulation and implementation of a national strategy for Alien Invasive Plants (AIP)
- Species reintroduction and replanting programmes for lost species and species high socio-economic value
- Alternative forms of livelihoods, and employment creation in the rural areas would relieve the pressure on natural forests and woodlands
- Monitoring of the harvesting of medicinal plants to avoid illegal bio-prospecting leading to the prevailing unsustainable exploitation of these products
- Formulation and implementation of education, awareness raising and capacity building programmes by government
- Introduction of community-based eco-tourism projects would save the natural resources in the area
- Natural Resources and Environmental Accounting would be very useful in monitoring the rate of utilization in natural forest s and woodlands
- The use of other means of energy other than fuel wood would relieve natural woodlands
- The national policies and legislation governing the use of natural resources such as forests and woodlands should be brought to the people, though there policies and laws in existence the local communities are not well versed about them

Lowveld: Siphofaneni (September, 2003, October, 2003)

- Establishment of community-based Natural Resource Management Committees working with the traditional authorities in regulating and monitoring the harvesting of forest resources

- Alternative forms of livelihoods, and employment creation in the rural areas would relieve the pressure on natural forests and woodlands
- Formulation and implementation of a national strategy for Alien Invasive Plants (AIP)
- Natural Resources and Environmental Accounting would be very useful in monitoring the rate of utilization in natural forest s and woodlands
- Species reintroduction and replanting programmes for lost species and species high socio-economic value
- Monitoring of the harvesting of medicinal plants to avoid illegal bio-prospecting leading to the prevailing unsustainable exploitation of these products
- Control of Forest Fires, by enforcing the Law
- The cut-down on stocking rates could reduce overgrazing and consequently lower the incidence of soil erosion and degradation
- Felling of multi-purpose trees and shrubs should be stopped without any reservations, and most probably by the Forest Act
- Donkeys in the area are destructive to indigenous plants and this is a concern
- The introduction of Local Knowledge Systems in our school curriculum, presently school going children do not respect the indigenous technical knowledge of their parents
- Developmental projects are damaging a lot of natural forests and woodlands in the area. Development has to be closed monitored to avoid the imminent irreversible loss of forest biodiversity in the area
- Training of local traditional healers on sustainable harvesting of medicinal products from the forests to leave the forests with an option to regenerate themselves
- There is an issue dubious young men (illegal immigrants from Mozambique) who harvest indigenous medicinal to sell in town, their harvesting is destructive and poses danger to the survival and future of these forest products
- The area needs Youth Environmental Programmes
- Introduction and promotion of Modern Agro-forestry Systems
- Control of people's movement: Regulating and monitoring the immigration and emigration of people which leaves natural forests and woodlands cleared and degraded
- Population Explosion leading to clearing of forests for human settlements
- Programmes for the eradication of indigenous encroaching species like *Dichrostaychs cinera* that replaces other indigenous flora
- Government should provide financial incentives for Chiefs to protect them from allocating land under bribes that results in too many households in a small area that clear away important biodiversity

Lubombo: KaShewula (September, 2003, October, 2003)

- Alternative forms of livelihoods, and employment creation in the rural areas would relieve the pressure on natural forests and woodlands
- Establishment of community-based Natural Resource Management Committees working with the traditional authorities in the regulating and monitoring the harvesting of forest products
- Formulation and implementation of a national strategy for Alien Invasive Plants (AIP)
- Empowerment of Chiefs and their Inner Council in natural resources management and support of the communities is pivotal
- Control of Forest Fires, by enforcing the Law
- Species reintroduction and replanting programmes for lost species and species high socio-economic value
- The national policies and legislation governing the use of natural resources such as forests and woodlands should be brought to the people, though there policies and laws in existence the local communities are not well versed about them
- Legislation must force community meetings on natural resources management, so that no one is left out, currently people absent themselves from meetings at their own will and there is no way to stop this unbecoming behaviour
- Establishment of community-based forest reserves would save the natural forests and woodlands
- Delivery of sustainable natural resources management briefs or speeches in dip tanks, co-operatives or associations where elderly people (who no longer attend school) normally meet
- Training of local traditional healers on sustainable harvesting of medicinal plants

APPENDIX 5

Species reported in Community Consultations in the various communities

SCIENTIFIC NAME	SISWATI NAME	SIPHON.	GR.VALL.	SHEW	HH.NORTH	MED	EDIBLE	THREAT.	TOP PRIOR.
Acacia polyacantha	Umtfolowesintfu	X				X			
Acacia xanthophloea	Umkhanyakudze	X	X			X			X
Acanthospermum glabratum	Sanama		X			X			
Alepidea amatymbica	Likhatsato			X		X			X
Aloe maculata	Emahala	X	X	X	X		X	X	X
Aloe spp.	Inhlaba	X	X	X		X	X		X
Annona senegalensis	Umtelemba	X	X	X		X	X		X
Antidesma venosum	Umbhubhuludla	X	X				X		
Asclepias spp.	Umdzayi	X	X				X	X	
Berchemia zeyheri	Umneyi/Tineyi	X	X	X	X	X	X	X	X
Berkheya setifera	Lulwimi lwenkhomo				X	X			
Boscia albitrunica	Ingwavuma		X			X			
Bowea volubilis	Gibisisila		X	X		X			X
Callilepsis leptophylla	Imphilane				X	X			
Canthium spp.	Umvutfwamini	X	X	X	X	X	X		
Catha edulis	Mlomomnandzi		X			X			
Cephalanthus natalensis	Umfomfo			X	X		X	X	X
Chenopodium album	Lubhici		X				X		
Combretum spp.	Imbondvo	X	X	X	X	X		X	X
Corchorus tridens	Ligusha		X				X		
Cyperus esculenthus	Umhlata				X		X		
Dioscorea spp.	Sikhundla				X	X			
Dovyalis caffra	Sangongongo		X				X		

SCIENTIFIC NAME	SISWATI NAME	SIPHON.	GR.VALL.	SHEW	HH.NORTH	MED	EDIBLE	THREAT.	TOP PRIOR.
Drimia altissima	Lukhovu				X	X			
Drimia delagoensis	Mahlanganisa	X	X	X	X	X		X	X
Ehretia amoena/rigida	Umklele	X					X		
Ekebergia capensis	Manyatsi	X	X			X			
Elaeodendron transvaalense	Ngcotfo	X				X			
Elephantorrhiza elephantine	Intfolwane	X				X			
Encephalantos petiolatum	Gebeleweni			X					X
Encephalantos spp.	Gebeleweni				X	X		X	
Englerophytum natalense	Emanumbela	X	X		X		X	X	
Euclea crispa	Sijelele	X					X		
Euclea divinorum	Umdlelanyamatane		X			X			
Euclea natalense	Emanumbela	X			X	X			X
F. vulgare	Imboziso				X	X			
Ficus spp.	Inkhokhokho		X			X			
Ficus sur	Umkhiwa	X	X	X	X		X	X	
Grewia flava	Umsiphane		X				X		
Grewia flavescens	Lambonjane		X				X		
Gunnera perpensa	Gobho				X	X			X
Gymnosporia heterophylla	Sihlangu (white)		X			X			
Gymnosporia senegalensis	Sihlangu (black)		X			X			
Harpephyllum caffrum	Umgonyogonyo			X		X	X	X	
Hypoxis spp.	Inkhofe		X		X	X			
Kraussia floribunda	Litsambolenja		X				X		
Lannea discolor	Tintokolovu	X	X	X	X		X	X	X
Lantana rugosa	Bukhwebeletane	X					X	X	
Lippea javanica	Umsutane				X	X			
Macrotyloma axillare	Emagosi		X				X		
Maesa lanceolata	Magucu		X			X	X	X	

SCIENTIFIC NAME	SISWATI NAME	SIPHON.	GR.VALL.	SHEW	HH.NORTH	MED	EDIBLE	THREAT.	TOP PRIOR.
Manilkara spp.	Umncwambi			X		X		X	
Maytenus mossambicensis	Umgungulutane		X				X		
Mimusops obovata/zeyheri	Umphushane				X		X		
Momordica balsamina	Inkhakha	X	X				X		X
Momordica cardiospermoides	Insubaba	X	X				X		X
Morus spp.	Emagumence				X		X		
Opuntia spp.	Sidolofiya		X				X		
Pappea capensis	Liletsa		X			X			
Parinari capensis	Umkhuna				X		X		
Passiflora edulis	Granadilla		X		X		X		
Peltophorum africanum	Umphungankhomo			X	X	X			
Phoenix reclinata	Lisundvu		X	X			X		
Pittosporum spp	Sibhaha		X			X		X	
Pittosporum viridiflorum	Sibhaha		X	X	X	X		X	X
Portulaca quadrifida	Emayenjane		X				X		
Psalliota campestris	Emakhowa	X	X	X			X	X	
Psidium guajava	Guava	X	X	X	X	X	X	X	X
Pterocarpus angolensis	Umvangati		X			X		X	X
Pterocarpus rotundifolius	Sivangatane		X			X			
Pyrenacantha grandiflora	Velabahleke				X	X			
Rotheca hirsuta	Sigibanyongo	X		X	X	X			
Rotheca myricoides	Manyongwane				X	X			
Sarcostemma viminale	Emaphoti	X	X	X			X		X
Schotia brachypetala	Vovovo	X	X	X		X		X	
Sclerocarya birrea	Umganu	X	X	X		X	X		X
Senecio rhyncholaenus	Imfenyana				X	X		X	
Siphonochilus aethiopicus	Sidvungule				X	X			X
Solanum nigrum	Umsobo	X					X		

SCIENTIFIC NAME	SISWATI NAME	SIPHON.	GR.VALL.	SHEW	HH.NORTH	MED	EDIBLE	THREAT.	TOP PRIOR.
Sonchus oleraceus	Ingabe	X					X		
Strychnos madagascarensis	Umkhwakhwa	X	X	X		X	X		X
Strychnos spinosa	Emahlala	X	X	X			X		
Syzgium cordatum	Tincozi	X	X	X	X		X	X	X
Terminalia sericea	Emangwe		X			X			
Trichilia emetica	Umkhuhlu		X			X			
Tulbaghia ludwigiana	Sikhwa	X	X				X		
Tylosema fassoglense	Khubakhulu				X	X	X		X
Vangueria infausta	Umntulwa	X	X	X	X		X	X	X
Vangueria spp.	Santulwane		X				X		
Xerophyta equisetoides	Sifunti				X	X			
Ximenia caffra	Ematfundvuluka		X	X	X		X		
Ziziphus mucronata	Umphafa		X				X		
	Bungolwane		X				X		
	Emadlashishi	X					X		
	Emahlabosi			X			X	X	
	Emanafu		X				X		
	Emanyamane	X	X		X		X		
	Imvutsela				X	X		X	
	Ingcalamatsanjane		X			X			
	Ingcina	X				X			
	Invoko					X			X
	Lihlungunyembe	X	X			X			
	Lisololo	X	X	X	X	X			
	Logwaja	X	X	X			X		
	Luhhwayi lagogo								
	Matfunga				X	X			
	Other game	X					X		

SCIENTIFIC NAME	SISWATI NAME	SIPHON.	GR.VALL.	SHEW	HH.NORTH	MED	EDIBLE	THREAT.	TOP PRIOR.
	Sikhabamkhobo	X	X			X			
	Sondeza				X	X		X	
Imbressia belina	Tibati	X	X	X			X	X	
	Tinhlwa	X		X			X	X	
	Tintsetse	X						X	
	Tinyosi	X	X	X			X		
	Umgamba	X	X			X			
	Umhlabelo		X			X		X	
	Umlulama		X			X		X	
	Umnyamatsi				X				
	Umsenge	X	X	X	X	X			
	Umsilinga	X	X			X			
	Umzaneno				X	X			
	Vimbobi				X	X		X	X

APPENDIX 6

Methods for valuing forests

Valuation Method	Relevant forest benefits	Strengths and weaknesses
Market prices: Use data from surveys of producers and consumers, adjusted if necessary to account for seasonal variation, value added processing and/or public policy distortion	Price-based valuation is commonly applied to NTFP which are partly or informally traded, in order to estimate subsistence and/or unrecorded consumption.	Market prices clearly reflect consumer preferences, but often need adjustment to account for public policy distortions or market failures. Aggregation or extrapolation of values based on potential production is not valid unless account is taken of likely price effects (elasticity of demand).
<u>Surrogate markets:</u> Travel cost-use survey data on direct costs (e.g. fares, accommodation) and, in some cases, opportunity costs of time spent travelling to and from a site, evaluated at some fraction of the average wage rate.	Travel cost is often used to estimate demand for forest recreation at specific locations. Related methods used mainly in developing countries estimate the value non-marketed, NTFP in terms of the opportunity cost of time spent collecting and/or processing them.	Provided the relation between the benefit being valued and the surrogate market is correctly specified, and prices in the surrogate market are not very distorted (e.g. by policy intervention), such methods are generally reliable.
Hedonic pricing-use statistical methods to correlate variation in the price of a marketed good to changes in the level of a related, non-marketed environmental amenity	Hedonic pricing is used to estimate the impact of proximity to forested land and/or logging on the prices of residential and commercial property	Travel cost estimates may need to account for various objectives (benefits) in a single trip.
Substitute goods-use market prices of substitutes for non-marketed benefits and level (or quality) of output of a marketed good/service	Substitute goods approaches may be used wherever close market substitutes for non-timber benefits exist. The effect of logging on hunting, downstream water users, fisheries and climate	Hedonic pricing requires large data sets, in order to isolate the influence of a non-market benefit on market price, relative to other factors

Valuation Method	**Relevant forest benefits**	**Strengths and weaknesses**
Stated preference: Contingent valuation method-use consumer surveys to elicit hypothetical individual willingness-to-pay for a benefit, or willingness-to-accept compensation for the loss of that benefit	Recreation values are often estimated using contingent valuation.	Contingent valuation estimates are generally considered reliable if strict procedural rules are followed
Contingent ranking/focus groups-use participatory techniques in group setting to elicit preferences for non-market benefits, either in relative terms (ranking) or in monetary terms	Stated preference methods such as CVM are the only generally accepted way to estimate non-use values, e.g. landscape or biodiversity values, for which price data do not exist and/or links to marketed goods cannot easily be established. Contingent ranking may be used where target groups are unfamiliar with cash valuation	Participatory valuation techniques are more experimental and not widely used to estimate non-market forest benefits. They are good at eliciting qualitative or "contextual" information, but there are doubts about their reliability for estimating willingness to pay.
Cost-based approaches Uses data on the costs of measures taken to secure, maintain and/or replace forest goods and services	Cost-based approaches include replacement/relocation cost, defensive expenditure and opportunity cost analysis; may be used (with caution) to value any type of forest benefit.	Cost-based approaches are usually considered less reliable than other methods. One test of validity is evidence that people are prepared to incur costs to secure relevant benefits

Source: Adapted from Bishop, 1999

APPENDIX 7

Summary of shortcomings of NWFP's resource assessments for valuation studies

Information	Main failing	Suggested methodology
Data representative of forest	Many studies only use one site and reasons for choice not given so not possible to use data for comparison or generalization	Ideally a sample of study sites (allow calculation of variance) or failing this presentation of reasons for site choice
Population profiles suitable for generalization	Information in anthropological studies not randomized and sample sizes small	Identification of main attributes of extractors (e.g. age, technology, income). Stratified random sampling of people in identified strata
Data representative of seasonal pattern of NWFP's use	Few studies include more than 1 years data	Random selection of same number of weeks and days from each month through at least one year. Careful examination of climate and other variable, e.g. larger economy to understand representativeness of study period
Quantification of product flows (quantities used by people)	Some studies value the stock (inventory) which relates to neither present nor sustainable flows	Identify, count, weigh and measure products as they enter village each day. Assess random sample of villages and households and ask extractors or randomly observe and record their consumption
Product weight	Weights may not be measured	If products too difficult to weigh in bulk, take seasonal sub-samples for mean weights
Product identification	Irregular use of scientific names or use of local names hinders comparison between studies	Collect specimens (vouchers, skulls, photographs) for definitive scientific identification
Catchment area for product extraction	Many studies do not record catchment area so not possible to determine yields per hectare	Direct observation, participatory mapping, travel time assessment, aerial photographs Global Positioning Systems (GPS), etc.
Sufficient observations	Insufficient if reliant on single researcher undertaking all observations	Train and use extractors to collect information or keep personal diaries (be aware of possible biases)
Value of product	Some researcher use expenditure of labour or energy as a measure of value which is not consistent with modern valuation theory	Use prices that exist for the commodity concerned or that prevail in related markets, e.g. use marketed good bartered for non-marketed product, use value of close substitute. Use contingent (willingness to pay) methods
Share of harvest going to the household and to the market	Few studies have done this but it is important as households and market goods are priced differently	Random sample of households asked to keep log books of daily income, expenses and amounts of NWFP's consumed or sold

Information	Main failing	Suggested methodology
Shadow prices	Important in providing an economic rationale for NWFP's that may not be financially profitable Require estimate valuation from a national viewpoint	Adjust for taxes and subsidies that cause price to deviate from opportunity cost of resource
Environmental externalities	No study has done this which means that conventional valuations underestimate economic benefits of NWFP's	No suggestions made
Marginal costs of extraction	No assessment of search times, cost of tools, etc., made for plant collection (has been made for animals in studies based on optimal-foraging theory)	Interviews, direct observation (instantaneous sampling, focal subject sampling), extractors diaries/records, log movements out of and into village
Wage rates	Some researchers have used country's official wage rate but this should not be done uncritically	Determine whether people actually pay each other. Note that rural wages vary by season, age, gender, and type of work
Cost of capital	Not often measured-use of market rate inappropriate	Use social discount rate-may be calculated locally otherwise use 4-5%
Sustainability	Three views: ✓ Indigenous people manage forest sustainability ✓ Indigenous people do not manage sustainability ✓ Sustainability is result of special conditions that must be identified in each case	Indirect: comparison of distance, frequency and duration of collection forays, recall of yields over time etc. Direct: comparisons of extraction and rates of reproduction/growth in the forest
Use of plant and animal extraction in single valuation	Not possible as botanists use returns per hectare while zoologist use returns per unit of labour	Multidisciplinary team comprising natural resource economist/economic anthropologist, botanist, zoologist; as well as indigenous people and local scholars

Source: Adapted from Wong et al.,(2001)

APPENDIX 8

Species reportedly harvested in the various study sites by the concerned villages

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
	SEE BOTTOM OF PAGE FOR INDEX KEY												
Acacia polycantha	Umtfolowesintfu									X			
Acacia xanthophloea	Umkhanyakudze									X			X
Acalypha spp.	Umsongo				X					X			
Acanthospermum glabratum	Sanama				X					X			
Agapanthus caulescens	Hlakahla			X	X					X			
Alepidea amatymbica	Likhatsato			X	X					X			
Allium spp.					X					X			
Allophylus africanus	Inhlangushane	X	X								X		
Aloe maculata	Emahala			X	X					X	X	X	X
Aloe spp.	Inhlaba			X	X	X	X			X			
Amaranthus spp.	Imbuya			X							X		
Annesorhiza flagellifolia	Sibhadze				X						X		
Annesorhiza macrocarpa					X								
Annona senegalensis	Umtelemba	X	X	X	X	X	X	X	X		X		
Anselia africana	Liphakama				X					X			
Antidesma venosum	Umbhubhuludla	X						X		X	X		
Asclepias spp.	Hlonyane			X	X			X			X	X	
Balanites maughamii	Umnono			X	X			X	X	X			
Berchemia zeyheri	Tineyi	X	X	X	X			X	X	X	X		X
Berkheya setifera	Lulwimi lwenkhomo									X			
Bidens pilosa	Chuchuza			X	X						X		
Boscia albitrunica	Ingwavuma									X			
Bowiea volubilis	Gibisisila									X			X
Callilepis laureola	Imphila							X		X			
Callilepis leptophylla	Imphilane									X			
Canthium mundianum	Siluwane								X	X			
Canthium spp.	Umvutfwamini					X	X	X	X	X	X		

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
Capparis tomentosa	Indodebovu				X					X			
Catha edulis	Mlomomnandzi									X			
Cephalanthus natalensis	Umfomfo					X	X				X	X	X
Ceratotheca triloba	Ludvonca					X	X				X		
Chenopodium album	Lubhici											X	
Cliffortia spp.?	Umnyebe				X								
Combretum spp.	Imbondvo							X		X			
Corchorus tridens	Ligusha			X	X						X		
Cyperus esculenthus	Umhlata										X		
D. biflorus	Emagosi										X		
Dais cotinifolia	Intfocwane			X	X	X	X	X		X			
Datura stramonium	Lijoye			X	X					X			
Dovyalia caffra	Sangongongo	X	X								X		
Drimia altissima	Lukhovu									X			
Drimia delagoensis	Mahlanganisa									X		X	X
E. petiolatum	Gebeleweni											X	X
Ehretia amoena	Umklele	X									X		
Ehretia rigida	Umcele	X									X		
Ekebergia capensis	Manyatsi									X	X		
Ekebergia pterophylla	Magwedla				X					X	X		
Elaeodendron transvaalense	Ngcotfo									X	X		
Elephantorrhiza elephantina	Intfolwane									X	X		
Englerophytum natalense	Emanumbela	X	X	X		X	X				X	X	X
Euclea crispa	Sijelele				X					X			
Euclea divinorum	Umdlelanyamatane									X			
Eugenia capensis	Inhlele	X	X								X		
F. vulgare	Imboziso									X			
Ficus sansibarica	Inkhokhopkho					X					X		
Ficus spp.	Inkhokhokho									X			
Ficus sur	Umkhiwa	X	X	X	X	X	X				X	X	
Grewia caffra	Liklolo										X		
Grewia flava	Umsiphane	X	X								X		

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
Gunnera perpensa	Gobho			X	X					X			
Gymnosporia heterophylla	Sihlangu (white)									X			
Gymnosporia senegalensis	Sihlangu (black)									X			
Haemanthus albiflos	Licishamlilo							X		X			
Harpephyllum caffrum	Umgonyogonyo					X	X			X	X	X	
Hyperacanthus amoenus	Ngcotfo				X					X	X		
Hypoxis spp.	Inkhofe									X			
Indigfera spp.	Chubhujeje				X					X			
Kigelia africana	Umvongotsi			X					X	X			
Kraussia floribunda	Litsambolenja										X		
Lannea discolor	Siganganyane	X	X			X	X				X		
Lannea edulis	Tintokolovu										X	X	X
Lantana rugosa	Bukhwebeletane										X	X	
Lippia javanica	Umsutane	X			X	X	X	X	X	X			
Macrotyloma axillare	Umgonsi				X						X		
Maesa lanceolata	Indende		X		X					X		X	
Manilkara spp.	Umncwambi										X	X	
Maytenus mossambicensis	Umgungulutane		X	X							X		
Melia azedarach	Umsilinga			X	X					X			
Mimusops obovata	Umphushane							X	X		X		
Mimusops zeyheri	Umphushane							X	X		X		
Momordica balsamina	Inkhakha			X	X					X	X		
Momordica cardiospermoides	Insubaba			X	X					X	X		
Mopane worms		X									X		
Morus spp.	Emagumence			X	X						X		
Ophioglossum lusoafricanum	Shucelane							X		X			
Opuntia spp.	Sidolofiya										X		
Oxygonum dregeanum	Umkhangu								X	X			
Ozoroa spp.	Imfuce				X					X			
Pappea capensis	Liletsa									X	X		
Passiflora edulis	Granadilla										X		
Peltophorum africanum	Umkhobamkhombe				X	X	X			X			

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
Phoenix reclinata	Lisundvu										X		
Pittosporum spp	Sibhaha									X		X	X
Pittosporum viridiflorum	Sibhaha	X		X	X	X	X	X	X	X			
Pollichia campestris	Emakhowa	X		X	X						X	X	
Portulaca oleracea	Silele			X	X						X		
Portulaca quadrifida	Emayenjane			X	X						X		
Psidium guajava	Guava	X	X					X	X	X	X		X
Ptaeroxylon obliquum	Umsatsi			X	X					X			
Pterocarpus angolensis	Umvangati										X	X	X
Pterocarpus rotundifolius	Sivangatane									X			
Pyrenacantha grandiflora	Velabahleke									X			
Rotheca hirsuta	Manyongwane			X					X	X			
Sarcostemma viminale	Emaphoti	X			X						X	X	X
Schotia brachypetala	Vovovo				X			X	X	X			
Sclerocarya birrea	Emaganu	X	X	X	X	X	X	X	X	X	X		
Senecio rhyncholaenus	Imfenyana										X	X	
Siphonochilus aethiopicus	Sidvungule					X	X			X			X
Solanum capense	Intfuma					X				X			
Solanum nigrum	Umsobo			X							X		
Sonchus oleraceus	Ingabe				X						X		
Strychnos madagascarensis	Umgulugulu	X	X	X	X			X		X	X		
Strychnos spinosa	Emahlala	X	X	X		X	X	X			X		
Syzygium cordatum	Tincozi	X	X	X	X	X	X	X	X		X		
Tabernaemontana elegans	Umkhahlu					X	X			X			
Terminalia phanerophlebia	Mangwe							X		X			
Trichilia emetica	Umkhuhlu					X	X			X			
Tulbaghia acutiloba	Lisela				X					X			
Tulbaghia ludwigiana	Sikhwa				X					X	X		
Tylosema fassglense	Khubakhulu									X			X
Vangueria infausta	Emantulwa	X	X	X	X	X	X	X	X		X		X
Vangueria spp.	Santulwane				X						X		
Vernonia spp.	Linyatselo			X						X			

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
Xerophyta equisetoides	Sifunti									X			
Ximenia caffra	Ematfundvuluka	X	X	X	X	X	X	X			X		
Ziziphus mucronata	Umphafa		X								X		
	Mabusa			X									
	Ndodenkulu			X									
	Silindzamatala			X	X								
Honey Bees	Tinyosi			X	X						X		
Imbressia belina	Tibati	X									X	X	
	Umbindolo	X											
	Mangololo							X					
	Mathema							X					
	Vimbephi							X					
	Dabulamanzi				X								
	Emapenza				X								
	Nkunzebovu				X								
	Umgugulutsi				X								
	Umnwele				X								
	Waphekula				X								
	Gejashisa					X	X						
	Minya						X						
	Bungolwane										X		
	Emadlashishi										X		
Termites	Emahlabosi										X	X	
Wax	Emanafu										X		
	Emangwe									X			
Caterpillars	Emanyamane	X									X		
	Imvutsela										X	X	X
	Ingcina									X			
	Invoko												X
	Lambonjane										X		
	Logwaja/rabbit										X		
	Luhhwayi lagogo									X			

Scientific/Common Name	SiSwati names	LV1	LV2	MV1	MV2	HV1	HV2	LP1	LP2	MED	ED	TH	TP
	Matfunga									X			
	Other game										X		
	Sikhundla									X			
	Sondeza										X	X	
Termites	Tinhlwa										X	X	
Locusts	Tintsetse										X	X	
	Umhlabelo										X	X	
	Umkhankha									X			
	Umlulama										X	X	
	Umphunganklomo									X			
	Umzaneno									X			
	Vimbobi										X	X	X

Keys:

LV1	Hlutse
LV2	Madvuma
MV1	Emoti
MV2	Kundodemnyama
HV1	Hhelehhele North
HV2	Mlumati
LP1	Jamehlungwini
LP2	Mangwenya
MED	Medicinal
ED	Edible
TH	Threatened
TP	Top Priority

APPENDIX 9

Species distribution in the various nominated natural woodlands

Species name	SiSwati name	Site	Woodland	Growth Form	Edible/Medicinal
Annona senegalensis	Umtelemba	Highveld	Lufafa	shrub	Edible fruit.
Englerophytum magalismontanum	Umnumbela	Highveld	Lufafa	tree	Edible fruit rich in vitamin C.
Ficus spp.	Umkhiwa	Highveld	Lufafa	tree	Edible fruit.
Halleria lucida	Ummita	Highveld	Lufafa	shrub	Sweet edible fruit.
Syzygium cordatum	Umncozi	Highveld	Lufafa	tree	Edible but acidic fruit
Vangueria infausta	Umntulu	Highveld	Lufafa	shrub	Edible fruit rich in vitamin C.
Aloe maculata	Emahala	Highveld	Lufafa	understory	Heart is edible & medicinal
Sclerocarya birrea	Umganu	Highveld	Lufafa	tree	Edible fruit & medicinal bark
Ansellia africana	Liphakama	Highveld	Lufafa	orchid	Roots are medicinal
Brachylaena ilicifolia	Umphahla	Highveld	Lufafa	tree	Leaves medicinal for diabetes.
Combretum spp.	Imbondvo	Highveld	Lufafa	tree	Leaves & roots medicinal
Cussonia spp.	Umsenge	Highveld	Lufafa	tree	Medicinal. Emetic.
Heteropyxis natalensis	Inkunzi	Highveld	Lufafa	tree	Aromatic leaves medicinal.
Pappea capensis	Dzilidzili	Highveld	Lufafa	tree	All parts are medicinal.
Parinari capensis	Umkhuna	Highveld	Lufafa	tree	Bark is medicinal
Pterocarpus angolensis	Umvangati	Highveld	Lufafa	tree	Bark & root medicinal.
Tricilia emetica	Umkhuhlu	Highveld	Lufafa	tree	Bark is emetic.
Tulbaghia ludwigiana	Lisela	Highveld	Lufafa	understory	Medicinal.
Celtis africanum	Liklolo	Lubombo Plateau	Shewula Nature Reserve	understory	Edible leaves.
Corchorus spp.	Ligusha	Lubombo Plateau	Shewula Nature Reserve	understory	Edible leaves.
Strychnos madagascariensis	Umkhwakhwa	Lubombo Plateau	Shewula Nature Reserve	tree	Edible fruit
Strychnos spinosa	Umhlala	Lubombo Plateau	Shewula Nature Reserve	tree	Edible fruit
Vangueria infausta	Umncozi	Lubombo Plateau	Shewula Nature Reserve	tree	Edible fruit rich in vitamin C.
Sclerocarya birrea	Umganu	Lubombo Plateau	Shewula Nature Reserve	tree	Edible fruit & medicinal bark
Aloe maculata	Emahala	Lubombo Plateau	Shewula Nature Reserve	understory	Heart is edible & medicinal
Berchemia zeyheri	Umneyi	Lubombo Plateau	Shewula Nature Reserve	tree	Edible & medicinal fruit.

Species name	SiSwati name	Site	Woodland	Growth Form	Edible/Medicinal
Adenium multiflorum	Sisila semphala	Lubombo Plateau	Shewula Nature Reserve	shrub	Medicinal. Male aphrodisiac
Aloe spp.	Inhlaba	Lubombo Plateau	Shewula Nature Reserve	shrub	Medicinal antibiotic
Cussonia spp.	Umsenge	Lubombo Plateau	Shewula Nature Reserve	tree	Leaves & roots medicinal emetic.
Ehretia rigida	Bhungela	Lubombo Plateau	Shewula Nature Reserve	tree	Medicinal for cuts.
Peltophorum africanum	Umkhabamkhombe	Lubombo Plateau	Shewula Nature Reserve	tree	Bark medicinal for stomach.
Sanseviera hyacinthoides	Sitfokotfoko	Lubombo Plateau	Shewula Nature Reserve	understory	Rhizomes & leaves medicinal.
Sanseviera hyacinthoides	Umutsi wetindlebe	Lubombo Plateau	Shewula Nature Reserve	understory	Rhizomes & leaves medicinal.
	Inomba	Lubombo Plateau	Shewula Nature Reserve	other	medicinal
	Umnunkulu	Lubombo Plateau	Shewula Nature Reserve	other	medicinal
Coddia rudis	Silulwane	Lubombo Plateau	Shewula Nature Reserve	shrub	Medicinal for fractures.
Annona senegalensis	Umtelemba	Lowveld	Hlutse	shrub	Edible fruit.
Strychnos madagascariensis	Umkhwakhwa	Lowveld	Hlutse	tree	Edible fruit
Strychnos spinosa	Umhlala	Lowveld	Hlutse	tree	Edible fruit
Aloe maculata	Emahala	Lowveld	Hlutse	understory	Heart is edible & medicinal
Bercemia. zeyheri	Umneyi	Lowveld	Hlutse	tree	Edible & medicinal fruit.
Sclerocarya birrea	Umganu	Lowveld	Hlutse	tree	Edible fruit & medicinal bark
Aloe spp.	Inhlaba	Lowveld	Hlutse	shrub	Medicinal antibiotic
Cussonia spp.	Umsenge	Lowveld	Hlutse	tree	Leaves & roots medicinal emetic.
Eulophia petersii	Liphakama	Lowveld	Hlutse	orchid	Medicinal
Peltophorum africanum	Umkhabamkhombe	Lowveld	Hlutse	tree	Bark medicinal for stomach.
Sanseviera hyacinthoides	Sitfokotfoko	Lowveld	Hlutse	understory	Rhizomes & leaves medicinal.
Tricilia emetica	Umkhuhlu	Lowveld	Hlutse	tree	Bark is emetic.
Dovyalis spp.	Sangongongo	Middleveld	Umtfumunye	shrub	Edible fruit
Ficus spp.	Inkhokhokho	Middleveld	Umtfumunye	tree	Edible fruit
Grewia flavescens	Lambonjane	Middleveld	Umtfumunye	shrub	Edible fruit & leaves.
Grewia spp.	Umsiphane	Middleveld	Umtfumunye	shrub	Edible fruit
Lannea antiscorbutica	Siganganyane	Middleveld	Umtfumunye	shrub	Edible fruit
Lannea discolor	Siganganyane	Middleveld	Umtfumunye	shrub	Edible fruit
Maytenus spp.	Umgungulutane	Middleveld	Umtfumunye	shrub	Edible fruit
	Emangwe	Middleveld	Umtfumunye	tree	edible

Species name	SiSwati name	Site	Woodland	Growth Form	Edible/Medicinal
Olea woodiana	Manyatsi	Middleveld	Umtfumunye	shrub	Edible fruit
Opuntia spp.	Sidolofiya	Middleveld	Umtfumunye	shrub	Edible fruit
Sarcostemma viminale	Emaphoti	Middleveld	Umtfumunye	understory	Edible stems & pods.
Strychnos madagascariensis	Umkhwakhwa	Middleveld	Umtfumunye	tree	Edible fruit
Vanguera spp.	Umntulu	Middleveld	Umtfumunye	shrub	Edible fruit
Vepris reflexa	Umbovane	Middleveld	Umtfumunye	tree	edible
Ziziphus mucronata	Umphafa	Middleveld	Umtfumunye	tree	Edible fruit
	Libhembedvu	Middleveld	Umtfumunye	other	edible
Berchemia zeyheri	Umneyi	Middleveld	Umtfumunye	tree	Edible & medicinal fruit.
Sclerocarya birrea	Umganu	Middleveld	Umtfumunye	tree	Edible fruit & medicinal bark
Acacia nigrescens	Umkhaya	Middleveld	Umtfumunye	tree	Medicinal
Albizia spp.	Sivangatane	Middleveld	Umtfumunye	tree	Bark medicinal but poisonous
Aloe spp.	Inhlaba	Middleveld	Umtfumunye	shrub	Medicinal antibiotic
Ansellia africanum	Liphakama	Middleveld	Umtfumunye	orchid	Roots are medicinal
Catha edulis	Mlomomunandzi	Middleveld	Umtfumunye	shrub	Medicinal stimulant.
Dombeya spp.	Umwuwane	Middleveld	Umtfumunye	shrub	Bark & leaves medicinal.
Elaeodendron transvaalense	Ingwavuma	Middleveld	Umtfumunye	tree	Roots & bark medicinal.
Ficus bubu	Intfombe	Middleveld	Umtfumunye	tree	Bark medicinal emetic.
Gymnosporia buxifolia	Sibhubhu	Middleveld	Umtfumunye	shrub	Medicinal
Olax dissitiflora	Mampunzane	Middleveld	Umtfumunye	tree	Medicinal
Pappea capensis	Liletsa	Middleveld	Umtfumunye	tree	All parts are medicinal.
Peltophorum africanum	Umkhabamkhombe	Middleveld	Umtfumunye	tree	Bark medicinal for stomach.
Pterocarpus angolensis	Umvangati	Middleveld	Umtfumunye	tree	Bark & root medicinal.
Sanseviera hyacinthoides	Umutsi wetindlebe	Middleveld	Umtfumunye	understory	Rhizomes & leaves medicinal.
Schotia spp.	Vovovo	Middleveld	Umtfumunye	tree	Bark is medicinal
Tetradenia riparia	Liphungula	Middleveld	Umtfumunye	shrub	Leaves for respiration.

Source: Author

Appendix 10

Matrix of NTFP's plant species commonly used in Swaziland

Matrix of NTFP's plant species commonly used in Swaziland	
Numbers have been assigned to each stated use 1-14	
Uses of each species are tabulated in Column D	
Botanical names have been updated to conform with "Swaziland Flora Checklist" 2004 by K.P. *et al*	
SUMMARY OF NUMBERED USES	
Legend	
1	Edible Leaves
2	Edible Fruits & Berries
3	Other Edible Portion
4	Medicinal
5	Wattle & Tannin
6	Fuelwood
7	Building
8	Floral
9	Landscape
10	Crafts & Household
11	Fodder & Forage
12	Tannins & Dyes
13	Thatching Plants
14	Cultural Plants

Latin Name	No. of Uses		Siswati Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Species with 6 Uses																		
Sclerocarya birrea	6		Umganu	Marula		Y		Y		Y			Y	Y	Y			
Species with 4 Uses																		
Bauhinia galpinii	4		Lusololo	Pride-of-the Kaap					Y	Y			Y	Y				
Berchemia zeyheri	4		Tineyi	Red Ivory		Y				Y	Y		Y					
Dichrostachys cinerea	4		Lusekwane	Sickle Bush						Y	Y				Y			Y
Euclea crispa	4		Indvodzemnyama, Umdlelanyamatane	Blue Guarri		Y		Y		Y	Y							
Syzigium cordatum	4		Umncozi	Water Berry		Y				Y	Y		Y					
Species with 3 Uses																		
Acacia dealbata	3		Umtfolo	Silver Wattle					Y	Y	Y							
Acacia karroo	3		Umgamba	Sweet Thorn									Y		Y	Y		
Brachylaena discolor	3		Umphahla	Coast Silver Oak						Y	Y			Y				
Ficus sur	3		Umkhiwa/Umkhiwane	Cape Fig		Y				Y			Y					
Phoenix reclinata	3		Lisundvu	Wild Date Plum		Y							Y	Y				
Ziziphus mucronata	3		Umphafa	Buffalo Thorn		Y									Y			Y
Species with 2 Uses																		
Acacia brevispica	2		Lugagane	Prickly Thorn						Y	Y							
Acacia davyi	2		Umgamba	Corky Thorn						Y	Y							
Acacia gerrardii	2		Singa	Red Thorn						Y	Y							
Acacia nigrescens	2		Umkhaya	Knobthorn						Y	Y							
Acacia nilotica	2		Umgamba	Scented Thorn									Y			Y		
Acacia spp.	2		Sitwetfwe	Thorn Trees						Y	Y							
Acacia tortilis	2		Umsasane	Umbrella Thorn						Y	Y							
Afzelia quanzensis	2		Umkholikholi	Pod Mahogany				Y							Y			
Aloe boylei	2		Inhlaba/Lisheshelu	Broad-leaved Grass Aloe			Y						Y					
Annona senegalense	2		Umtelemba	Wild Custard Apple		Y				Y								

Latin Name	No. of Uses		Siswati Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Asclepias spp.	2		Sidzayi/Umdzayana		Y		Y											
Boscia albitrunica	2		Ingwavuma lensikati	Shepherds Tree				Y							Y			
Breonadia salicina	2		Umhlume	African Teak						Y	Y							
Clausena anisata	2		Umnukelambiba	Horsewood		Y		Y										
Combretum apiculatum	2		Imbondvo lemhlophe	Red Bushwillow											Y			Y
Combrretum spp.	2		Imbondvo							Y	Y							
Cordyla africana	2		Thunzikhulu	Wild Mango			Y							Y				
Cussonia spp.	2		Umsenge	Cabbage Tree				Y							Y			
Elephantorrhiza elephantima	2		Intfolwane	Eland's Bean	Y	Y												
Erythrina lysistemon	2		Umsinsi	Common Coral Tree									Y	Y				
Faurea spp.	2		Sicalaba	Beechwoods						Y	Y							
Ficus spp (3)	2		Inkhiwane	Figs		Y				Y								
Halleria lucida	2		Umbinta	Tree Fuschia		Y									Y			
Lannea discolor	2		Sigaganjane	Tree Grape		Y				Y								
Pittosporum viridiflorum	2		Umfusamvu	Cheesewood		Y		Y										
Pterocarpus angolensis	2		Umvangati	Wild Teak						Y				Y				
Strelitzia caudata	2		Inkhamango	False Wild Banana			Y						Y					
Themeda triandra	2		Intunga	Red Grass											Y		Y	
Trichilia emetica	2		Umkhuhlu	Thunder Tree		Y		Y										
Species with 1 Use																		
Acacia caffra	1		Umgamba	Cat Thorn											Y			
Acacia decurrens	1		Umgamba	Green Wattle					Y									
Acacia longifolia	1		Umgamba	Golden Wattle					Y									
Acacia mearnsii	1		Umgamba	Black Wattle					Y									
Acacia senegal	1		Umgamba	Three Hook Thorn											Y			
Acacia xanthophloea	1		Umgamba	Fever Tree									Y					
Acalypha spp	1		Umsongo	Forest False Nettle				Y										
Adiantum capillus- veneris	1			Black Maidenhair Fern								Y						

Latin Name	No. of Uses		Siswati Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Alepidea longifolia	1		Linjata		Y													
Alepidea spp.	1		Likhatsalo	Kalmus				Y										
Allium spp.	1		Sisdsidsimba				Y											
Aloe chabaudii	1		Inhlaba	Chabaud's Aloe									Y					
Aloe cooperi	1		Inhlaba	Cooper's Aloe									Y					
Aloe dewettii	1		Inhlaba	De Wet's Aloe									Y					
Aloe kniphofioides	1		Inhlaba	Grass Aloe									Y					
Aloe maculata	1		Emahala	Common Soap Aloe			Y											
Aloe parvibracteata	1		Inhlaba	Aloes									Y					
Aloe spp.	1		Emadzima	Aloes			Y											
Aloe suprafoliata	1		Inhlaba	Book Aloe									Y					
Alternanthera sessilis	1		Imbuya	Pigweed	Y													
Amaranthus spinosus	1		Imbuya batfa	Pigweed	Y													
Amaranthus thunbergii	1		Insheke	Pigweed	Y													
Aneilema aequinoctiale	1		Lidzanyamane	Clinging Aneilema											Y			
Aneilema hockii	1		Lidzanyamane												Y			
Annesorhiza flagellifolia	1		Sibhadze	Anise Roor	Y													
Ansellia africana	1		Liphakama	Leopard Orchid				Y										
Asparagus macowanii	1		Silevu sembuti	Zulu Asparagus														
Athrixia elata	1		Luphephetse	Daisy Tea			Y											
Azima tetracantha	1		Umvusankunzi	Needle Bush		Y												
Balanites maughami	1		Liphambo	Torchwood				Y										
Berkheya setifera	1		Lulwimi lwenkhomo	Buffalo Tongue				Y										
Bidens pilosa	1		Chuchuza	Blackjack	Y													
Bolusanthus speciosus	1		Umhhohlo	Elephant Wood Tree				Y										
Boophane distica	1		Incumbe	Cape Poison Bulb				Y										
Brachylaena ilicifolia	1		Umphahla	Small Bitter Leaf										Y				
Brachystelma gerrardii	1		Sidsendza	Hottentot's Bread			Y											

Latin Name	No. of Uses		Siswati Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bridelia micrantha	1		Umhlalamahubhulu	Velvet Sweetberry		Y												
Caesalpinea decepetala	1		Lugagane	Mauritius Thorn												Y		
Canthium spp(3)	1		Umvutfwamini			Y												
Capparis spp.	1		Liphambo	Caper Bush				Y										
Carissa tetramella	1		Umvusankunzii	African Viagra				Y										
Cephalanthus natalensis	1		Umfomfo	Tree Strawberry		Y												
Ceratotheca triloba	1		Ludvonca	African Foxglove				Y										
Chenopodium album	1		Imbilikiicane	Lamb's Quarters	Y													
Clivia caulescens	1		Hlakahlawemahlatsi	Clivia				Y										
Colcasia antiquorum	1		Umdzebedzebe	Taro	Y													
Coleochloa setifera	1		Lutindzi											Y				
Combretum collinum	1		Imbondvo lemhlophe	Weeping Bushwillow														Y
Combretum erythrophyllum	1		Umdvubu	River Bushwillow						Y								
Combretum zeyheri	1		Imbondvo lemhlophe	Large-fruited Bushwillow														Y
Commelina africana	1		Lidzanyamane	Yellow Commelina											Y			
Corchorus spp.	1		Ligusha		Y													
Crocosmia paniculata	1		Umlunge	Falling Stars									Y					
Crocosmia pottsii	1			Slender Crocosmia									Y					
Curcubitaceae spp.	1		Tjwalabenyoni	Wild Cucumbers		Y												
Cyathea spp.	1		Inkhomankhoma	Tree Fern				?										
Cyperus albostriatus	1		Incoshane	Forest Star Sedge										Y				
Cyperus articulatus	1		Inchoboza	Sedge										Y				
Cyperus compressus	1			Sedge								Y						
Cyperus difformis	1		Incoshane	Sedge										Y				
Cyperus fastigiatus	1		Insikane	Sedge										Y				
Cyperus latifolius	1		Likhwane	Sedge										Y				
Cyperus marginatus	1		Inchoboza	Sedge										Y				
Cyperus semitrifidus	1		Incoshane	Sedge										Y				

Latin Name	No. of Uses		Siswati Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cyperus sexangularis	1		Incoshane	Tall Star Sedge										Y				
Cyphia bolusii	1		Ligagajane				Y											
Cyphostemma woodii	1		Inkhonyane	Hairy Grape Bush		Y												
Cyrtanthus bicolor	1		Ummpimpiliza	Fire Lily			Y											
Datura stramonium	1		Liljowe	Thorn apple				Y										
Desmodium repandum	1			Tick trefoil										Y				
Dichrostachys spp.	1		Umtsetane	Sickle Bush						Y								
Dioscorea cotinifolia	1		Lunyawo lwendlovu	Wild Yam				Y										
Diospyros dicrophylla	1		Umchafucane lomnyane	Poison Peach		Y												
Diospyros lycodies	1		Umchafutane lomhlophe	Quilted Bluebush		Y												
Dipcadi spp.	1		Ncamjolo/Umgcobane				Y											
Dissotis spp.	1		Sichobochobo	Ordeal Bean				Y										
Dombeya rotundifolia	1		Umwuwane	Common Wild Pear				Y										
Dovyalis spp (4)	1		Emabambane	Kei-apple		Y												
Drima altissima	1		Lukhovu	Tall White Squill				Y										
Drimia delagoensis	1		Mahlanganisa	Itch-egg				Y										
Duvalia polita	1		Tililo lomncane	Hottentot's Toes				Y										
Ehretia amoena	1		Umklele	Sandpaper Bush		Y												

Appendix 11

Specimens of Record Sheets for Community in Consultations, User Surveys and Resource Surveys

(1)

QUESTIONNAIRE USED IN COMMUNITY CONSULTATIONS:

Non-timber Forest Products (NTFP's).

STUDY SITE

ECOLOGICAL ZONE

EDIBLE Spp./MEDICINAL Spp./THREATENED Spp./TOP PRIORITY Spp./etc				
SCIENTIFIC NAME	**COMMON NAME**	**SiSWATI NAME**	**PART USED/END USE**	**RESPONSES: %male, % female**

(2)

USER SURVEYS

Questionnaire for the harvested and utilized Edible and Medicinal Non-timber Forest Products in targeted natural forests and woodlands. Highveld, Lowveld, Middleveld and Lubombo-Swaziland. PRODUCT FLOW VALUE..

STUDY SITE
NAME OF COMMUNITY/VILLAGE
IDENTITY OF HOUSEHOLD
NUMBER OF PEOPLE & OCCUPATIONS
FARMING INCOME
OTHER INCOME
WINTER or SUMMER SURVEY - DATE

Harvested product	Harvesting period	Where harvested	Harvested quantity	How often	Domestic quantity	Trade quantity	Time to forest	Time in forest	Distance to forest	How processed	Process time	Farmgate price	Tools used	Transport Used

(3)

RESOURCE SURVEYS

Table for the Quantitative Inventory of preferred edible & medicinal non-timber forest products in targeted natural forests and woodlands in Swaziland: Highveld, Middleveld, Lowveld and Lubombo.

TREES in MAIN PLOT (50m x 50m)

Common Name	Species Name	Productive Lifespan	Number of Individuals	Annual Prod. per individual	D.B.H. & hght.	Unit price	Total value	Reproductive condition

(4)

RESOURCE SURVEYS

Table for the Quantitative Inventory of preferred edible & medicinal non-timber forest products in targeted natural forests and woodlands in Swaziland: Highveld, Middleveld, Lowveld and Lubombo.

SMALL TREES/SHRUBS & UNDERSTORY in SUBPLOTS (20m x 20m & 10m x 10m)

Common Name	Species Name	Productive Lifespan	Number of Individuals	Annual Production per Individual.	Size	Unit Price	Total Value	Other comments