

Full Length Research Paper

Community consultations on use and management of preferred NTFPs: A case study of the four ecological zones of Swaziland

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Traditional forest management systems were part of daily life in the natural forest and woodland resources in olden days Swaziland. The objective of the study was to embark on community consultations to collect information on their perception of preferred edible and medicinal non-timber forest products (NTFPs), their direct uses, the existing management strategies, the threats to forest biodiversity and the domestication and commercialization initiatives. Group discussions, individual perceptions and review of national forest policy were undertaken. The findings indicated that 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 NTFP management systems. Uncontrolled trade in NTFPs, by non-resident collectors in Swaziland has been seen to be one of the predominant threats to forest biodiversity. This reaffirms the weak and ineffective national policies and legislation, and shows that the existing policies and legislation are not implementable. The positive side is that local communities have identified potential threats to forest biodiversity. All 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 commercialization. The institutional, cultural, socio-economic, ecological/environmental and policy issues raised by local communities are crucial and essential elements for the formulation and development of guidelines for local-level sustainable management and development of NTFPs. Proper and innovative policies and legislation need to be put in place to cope with the current challenges.

Key words: Natural forests, natural woodlands, forest products, sustainability, national forest policies, forest management, community participation, forest biodiversity.

INTRODUCTION

In Swaziland, 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 uncoordinated and done in isolation from each other (Geldenhuys, 2002,

2003, 2004; Dlamini, 2007, 2010a). Furthermore, it is clear that the current control mechanisms, 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; Dlamini, 2007).

New approaches to forest sustainability anywhere have developed strong partnerships between academia, government, the environmental community and the

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industry and this has proved to be the most successful remedy (Abubakr et al., 1997; Crafter et al., 1997; GOS, 2002; Dlamini, 2007). 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; Dlamini, 2007). 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; 2002a; Dlamini, 2007).

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, 2002; Nibbering and Samyn, 2002; Sreedharan, 2002; Dlamini and Geldenhuys, 2011a).

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 democratization 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, 2002; Sreedharan, 2002; Dlamini, 2007).

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 fulfill basic requirements; non-timber forest products (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). NTFP 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.

The specific objective of the study was 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, the threats to forest biodiversity and the domestication and commercialization initiatives. The study focused on Swaziland.

The specific research questions were:

1. 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 optimization of these policies for equitable and sustainable development of NTFPs at the local level?
2. What are the potential threats to forest biodiversity that can lead to the loss of these NTFPs?
3. 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 preferred edible and medicinal NTFPs?
4. Are the local people really aware of the opportunity cost of the surrounding natural forests and woodlands?
5. 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?
6. What domestication and commercialization initiatives are in place for preferred edible and medicinal NTFPs?

The hypothesis to be tested was:

There are no existing traditional forest management plans that can complement the national policies

METHODS

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 (within the six physiographic zones) of the country (Godoy et al., 1993; FAO, 2001; Dlamini, 2007; Dlamini and Geldenhuys, 2011b) (Figure 1). 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 (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 (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; Dlamini, 2007; Dlamini and Geldenhuys, 2011b). 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).

- Map 1 - PHYSIOGRAPHIC ZONES MAP**

select only two villages appropriate for this study in accordance with selection criterion 2;

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 in Box 1

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 and a compilation of questions raised is presented in Box 2.

Data analysis

Group discussions

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

Individual perceptions

The data collected on all the responses was compiled, sorted and coded, stored in Excel and analyzed. 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 (ε_{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. 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 (for example, products, sites, gender and species).

Review of current national forest policy

The issues raised by communities on local-level sustainable forest management, after the discussion of the National Forest Policy (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.

RESULTS

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.

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 1. 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 (that is, threats). For example 40/40 community respondents pointed out that "Alien Invasive Species" as a threat to forest biodiversity at Hhelehhele North, Grand Valley and Shewula). The most common threats were alien invasive plants and drought.

Traditional species management systems

Traditional authorities (village leadership structures) are responsible for the local-level management of natural forests and woodlands, which entails the sustainable harvesting of forest foods, 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 3.

National Policies and legislation

The communities are not versed with any functional and

Box 1. Brief description of the four ecological zones of Swaziland.

Ecological zone and characteristics

Highveld:

The Swaziland Highveld (altitude: 900 to 1400m) 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. Mean annual rainfall is 850 to 1400 mm. Characterized by short grassland with evergreen forest patches

Middleveld:

The Upper Middleveld (altitude: 600 to 800m) 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 (altitude: 400 to 600m) 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. Mean annual rainfall is 650 to 1000 mm. Dominated by tall grassland with scattered trees and shrubs and broad-leaved savanna

Lowveld:

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 (altitude: 250 to 400m) on sandstone or claystone and the lower Eastern Lowveld (altitude: 200 to 400m) on basalt. Mean annual rainfall is 550 to 725 mm. There is a combination of Mixed savanna and Acacia savanna

Lubombo:

The Lubombo Range (altitude: 250 to 600m) 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. Mean annual rainfall is 700 to 825 mm. Usually has hillside bush and plateau savanna

Source: Dlamini (2007).

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 Shewula respectively.

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.

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 Shewula 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.

Domestication and commercialization of indigenous non-timber forest products (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 that include *Breonadia salicina*, *Brachylaena ilicifolia* and other unidentified species. In addition, the communities are also in the process of establishing orchards for indigenous edible species. All these initiatives are under the Chief's management (a chief being the highest person in the village leadership).

The other communities in the Grand Valley/Kakholwane and Siphofaneni study sites have priority species (*Syzygium cordatum* and *Berchemia zeyheri*) for domestication and mass propagation but do not have any

Box 2. Questions raised to participants.**Group discussions**

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

- (a) What are the major land uses 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 commercialization potential for NTFPs in the area?
- (h) Which natural forests and woodlands can be considered or nominated for research and development?

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 commercialization (Refer to Appendix 11 for a specimen of the data collection form)

Review of the current National Forest Policy

Step 1: the SiSwati version of the NFP was read and discussed during a community consultation meeting in all the study sites.

Step 2: 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 3: 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

Box 3. 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

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

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 commercialization programmes. Hhelehhele North, Grand valley, Siphofaneni and Shewula had 62.5, 77.5, 47.5 and 67.5% positive responses for

implementing NTFP domestication initiatives.

Resource use

The Siphofaneni site in the lowveld has the highest

Table 1. 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	Shewula
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

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

Table 2. Reported number of species in the various study sites - community consultations.

Product group	Grand Valley	Hhelehhele North	Shewula	Siphofaneni
Preferred edible plant species	38	16	16	20
Preferred edible animal species	4	0	5	7
Preferred 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

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 (for more details refer to Table 1).

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 (plants facing extinction), threatened edible plant species and top priority species (most desirable or preferred) for immediate domestication and commercialization (Table 2). 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 commercialization.

Analysis of responses on preferred non-timber forest products (NTFPs)

The results were analyzed for products (7 groups), site (4), species (129) and gender (2). The product groups were edible animals, edible plants, medicinal plants,

Table 3. The variation in the average number of responses and number of NTFP 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

Means with same letter indicates no differences.

Table 4. The variation in the number of responses and number of NTFP species reported during community consultations between the various study sites.

Level of site	Number of NTFP 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

Means with same letter indicates no differences.

Table 5. 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, not-significant.

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 3 and for sites presented in Table 4. The detailed analysis of variance (ANOVA) across sites is shown in Table 5, and for individual sites in Table 6.

Graphical representation of the percentage responses of community representatives for the various product groups within each of the study areas is shown in Figures 2, 3, 4 and 5. Please note the dependent variable here in this analysis is % people and not % species and that top priority species is a product class as per the people's perceptions and not statistically validated.

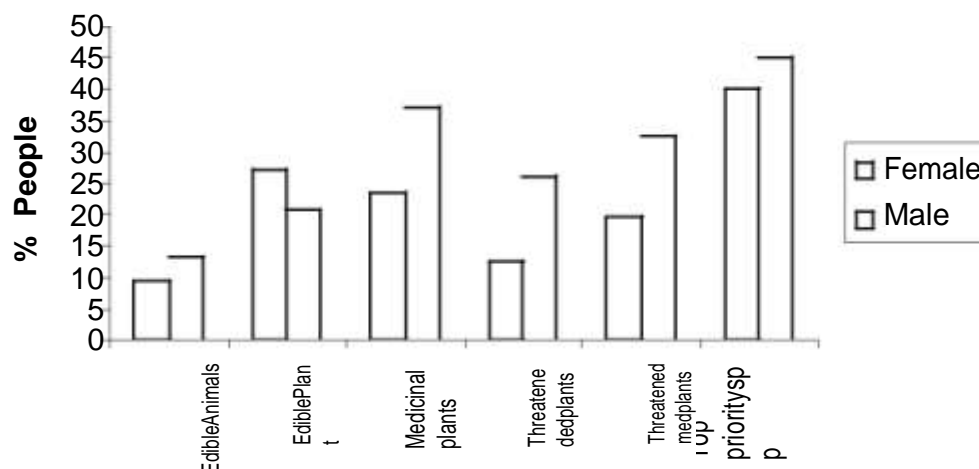


Figure 2. Graphical representation of the percentage responses of community representatives for the various product groups at Grand Valley area.

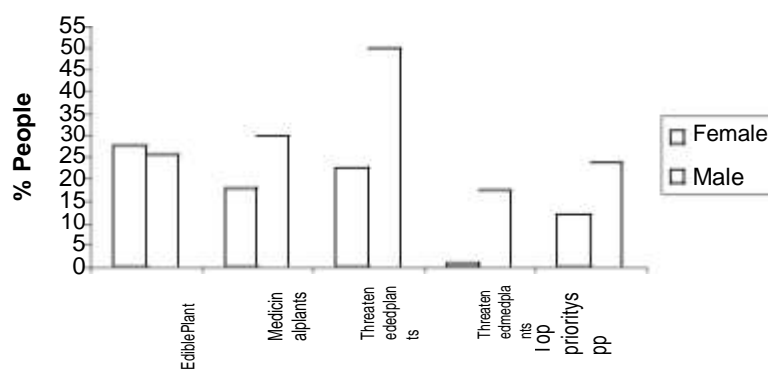


Figure 3. Graphical representation of the percentage responses of community representatives for the various product groups at Hlelehhele area.

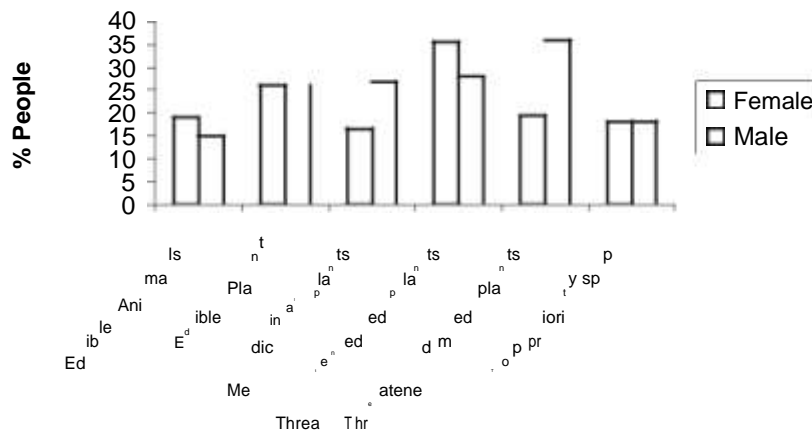


Figure 4. Graphical representation of the percentage responses of community representatives for the various product groups at Shewula Nature Reserve

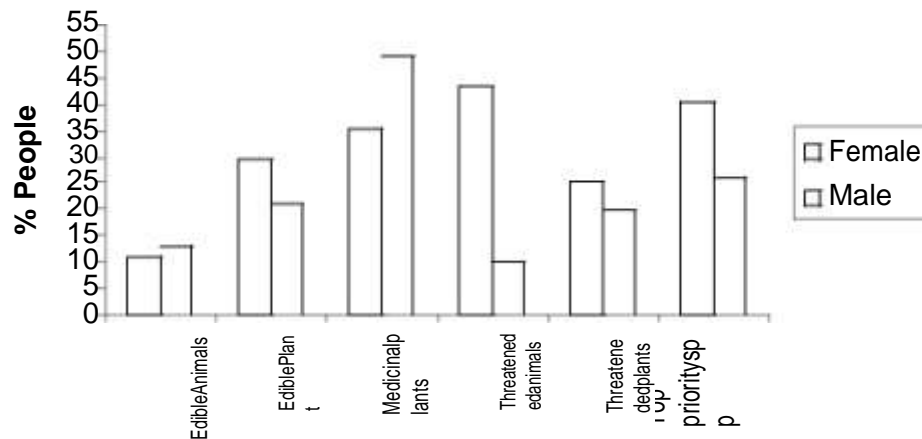


Figure 5. Graphical representation of the percentage responses of community representatives for the various product groups at Siphofaneni area.

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 ($p < 0.813$) (Table 5).

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 Hlelehhele 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.

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.

In overall, commonly reported preferred edible NTFPs include the following: *Sclerocarya birrea*, *B. zeyheri*, *Strychnos madagascariensis*, *Strychnos spinosa*, *Englerophytum natalense*, *Aloe maculata*, *Syzygium cordatum*, *Vangueria infausta*, *Psidium guajava*, *Psalliotia campestris*, edible caterpillars and bee honey. The commonly preferred medicinal NTFPs included the following:

S. birrea, *P. guajava*, *B. zeyheri*, *A. maculata*, *Rothea 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 *P. guajava*. This shows that some invasive alien species contribute positively to household health and food needs.

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 underpin the national efforts and programmes to combat degradation of natural resources and the environment (Table 7).

DISCUSSION

The results of the study show that the major land uses in the four study sites are more inclined to traditional

Table 6. 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 among 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)			
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 Plateau)			
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)			
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, not-significant.

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;

Table 7: Issues raised in Community Consultations

Major Issues	Associated Issues
Institutional issues	-Community-based natural resources management committees
Socio-cultural issues	-Modern agro-forestry systems -Empowerment of chiefs -Incentives for chiefs
Environmental and Ecological issues	-Youth environmental programmes -Invasive alien plants strategy -Forest fires -Species re-introduction and replanting programmes
Socio-economic issues	-Eco-tourism -Alternative forms of livelihoods
Policy issues	-National and international policies and legislation -Forest reserves -Harvesting monitoring -Education and awareness -Matching resource use with resource availability -Alternative sources of energy -Forest act -Development projects versus natural woodlands -Gender, biodiversity and local knowledge systems -Resettlement programmes -Sustainable natural resources management briefs

Dlamini, 2007). In similar studies, Dovie et al. (2001), Dovie (2003b), Shackleton (1996), Shackleton and Shackleton (2000, 2002, 2004, 2006) and Shackleton et al. (2000, 2002) reported that the majority of South Africans reside in the rural areas characterized by limited infrastructure and lack of employment 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), Dlamini (1997, 1998, 2007, 2010b).

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 alien invasive species, encroachment, browsing 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, 2001, 2002; Dlamini, 2007). There is a strong need for development programmes to address these issues. Such programmes

and projects should include the control of invasive species, overexploitation of endangered species, the control of forest fires and the reduction of overstocking and overgrazing. These programmes need to be developed in conjunction with the National Biodiversity Strategy and Action Plan (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 analyzed at the Harvard Institute for International Development.

The status of domestication and commercialization in the study sites shows that the country is behind the rest of the Southern Africa Development Community (SADC) member countries. Most of the neighbouring countries have embarked on massive domestication and commercialization programmes and projects. Swaziland might benefit from the CP Wild project (CP Wild, 2004; Dlamini, 2007), 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 Sustainable Forest Management (SFM), where forest goods and services are managed for present and future generations. This is seen in the 100% attendance and participation of community representatives reported earlier.

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, 2002; Dlamini and Geldenhuys, 2009). 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. According to Dlamini (2007), 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 aforementioned 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 commercialization. Studies in the Republic of South Africa done by Shackleton and Shackleton (1997, 2004, 2006) and Shackleton et al. (2002), and in Swaziland by Dlamini (2011a) and Dlamini and Geldenhuys (2009, 2011a, b) also highlighted several NTFP resources that are utilized by rural communities, that is, fuelwood, construction wood, edible fruits, edible herbs, edible insects, medicinal plants, bush meat, bee honey, reeds for weaving and grass hand brushes. Most of the NTFP species reported in South Africa are also extensively utilized in Swaziland as well, according to the list of species reported in the community consultations.

The Grand Valley site reported a significantly higher number of edible species. 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; Dlamini, 2007). 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 commercialization.

This means local, national, regional and international initiatives and programmes towards domestication and commercialization 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. However, during the meetings, the women showed more interest and knowledge about edible species than medicinal species while 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.

The final programme under the consultations was the review of the SiSwati translated version (SiSwati being the local language) 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. 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 addition, the main issues raised in the community consultations are in line with issues 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
5. National Resettlement Policy
6. National Energy Policy
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 relegated to powerless figures, as people were more enlightened about their rights. However, the new National Forest Policy give hope 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.

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 through harvesting of NTFPs. The absence of local level NTFP 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 NTFP species that are currently threatened and endangered due to over-exploitation and unsustainable use. The commercialization 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 un-prescribed and uncontrolled burning systems and heavy infestation by alien invasive species have lead to a rise in veld fires (that is, wild fires) resulting in the decline in forest quality and vitality (manifested by disappearance of important NTFP 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 checked. 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 use ownership;

4. Local and national governments and development partners 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 partners should ensure that stakeholders, particularly collectors, growers and traders, are provided with incentives to sustainably manage NTFPs.

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

- a. Building NTFP use into management plans;
- b. Defining the role of governments and NGO's in community participation;
- c. Addressing policy, legal and institutional issues (policy and legislation, property rights and land tenure systems);
- d. Promoting education and training at all levels of society.

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REFERENCES

- Abubakr S, Kilgroe MA, Chapman K (1997). New Approaches to Forest Sustainability. Environmental Conference and Exhibit/477. Minneapolis Convention Centre, Minneapolis, Atlanta, USA. MN. 5-7, May.

- Appasamy PP (1993). Role of Non-Timber forest products in a subsistence economy. The case of a joint forestry project in India. *Econ. Bot.*, 47 (3): 258-267.
- Campbell BM, Luckett M, Swenes I (1997). Local-level valuation of Savanna Resources: A case study from Zimbabwe. *Econ. Bot.*, 51(1): 59-97.
- Crafter SA, Awimbo J, Broekhoven AJ (1997). Non-timber forest products: Value, use and management issues in Africa, including examples from Latin America. Proceedings of a workshop on Non-timber Forest Products. Naro Moru, Kenya, 8-13 May, 167p.
- DANCED (Danish Corporation for International Development) (1999). Forest Resource Assessment. Ministry of Agriculture and Cooperatives, Mbabane, Swaziland, 42p.
- Dlamini CS (1997). Germination pre-treatment in the seeds of *Sclerocarya birrea* (A. Rich) Hochst. sub-species *caffra* (Sond). Kokwaro (ANACARDIACEAE) - The Marula. Unpublished BSc. Hons. Mini Project, University of Stellenbosch, Stellenbosch. South Africa.
- Dlamini CS (1998). Provenance and family variation in germination, early seedling growth, fruit composition and seed mass in *Sclerocarya birrea* (A. Rich) Hochst. sub-species *caffra* (Sond). Kokwaro (ANACARDIACEAE) - The Marula. M.Sc. Thesis. University of Stellenbosch, Stellenbosch, 99p.
- Dlamini CS (2007). Towards the Improvement of Policy and Strategy Development for the Sustainable Management of Non-timber Forest Products: Swaziland: A Case Study. Ph.D. Dissertation. University of Stellenbosch. RSA, 249p.
- Dlamini CS (2010a). Towards the improvement of policy and strategy development for the sustainable management of non-timber forest products: A synthesis of recent studies from Swaziland. In: Tevera, D.S. and Matondo, J.I (eds). Socio-economic Development and the Environment in Swaziland. Department of Geography, Environmental Science and Planning, University of Swaziland.
- Dlamini CS (2010b). Provenance and family variation in germination and early seedling growth in *Sclerocarya birrea* sub-species *caffra*. *J. Hort. For.*, 2 (9): 229-235. www.academicjournals.org/JHF/abstracts/abstracts2010/Nov/Dlamini.htm
- Dlamini CS, Geldenhuys CJ (2009). The Socio-economic Status of the Non-timber Forest Product Sub-sector in Swaziland. *Southern For.*, 71(4):311-318.
- Dlamini CS, Geldenhuys CJ (2011a). (in press). The potential impacts of national, regional and international policies and legislation on the sustainable forest management for NTFPs: A Swaziland Case Study. *J. Agric. Sci. Technol.*, pp. 579-585
- Dlamini CS, Geldenhuys CJ (2011b). An assessment of non-timber forest products in the four ecological zones of Swaziland as a basis for policy and strategy development. *J. Agric. Sci. Technol.* (In press).
- Dovie BKD (2003b). Rural Economy and livelihoods from the non-timber forest products trade. Compromising sustainability in southern Africa? *Int. J. Sustain. Dev. World Ecol.*, (10): 247-262.
- Dovie BKD, Shackleton CM, Witkowski TF (2001). Valuing non-timber forest products-indicator for interplay between poverty, livelihoods and the environment. Presented at an open meeting of the Global Environment Change Research Community, Rio de Janeiro, pp. 6-8.
- FAO (2001). Non-Wood Forest Products in Africa: A Regional and National Overview. FAO Forestry Working Paper FOPW/01/1. FAO, Rome, 303p.
- Geldenhuys CJ (2002). Concepts and approach towards development of sustainable resource use of non-timber forest products: the example of bark harvesting for traditional medicine. In: Seydack, A.H.W., Vorster, T., Vermeulen, W. J. and Van der merve, I.J. (eds). Multiple use management of natural forests and savanna woodlands: Policy refinements and scientific progress. Proceedings of Natural Forests and Savanna Woodlands Symposium III 6-9 May 2002, Bergen-Dal, Kruger National Park, pp. 91-104.
- Geldenhuys CJ (2003). Bark Harvesting for Traditional Medicine: from illegal resource degradation to participatory management. *Scand. J. For. Res.*, 19(4): 103-115.
- Geldenhuys CJ (2004). Meeting the demand of *Ocotea bullata* bark. Implications for the conservation of high value and medicinal tree species. In: Lawes, M.J., Eeley, H.A.C., Shackleton, C.M. and Geach, B.G.S (Eds). Indigenous Forests and Woodlands in South Africa: Policy, People and Practice. University of KwaZulu-Natal Press. Scottsville, South Africa, pp. 517-550.
- Glass GV, Peckham PD, Sanders JR (1972). Consequences of Failure to meet assumptions underlying the fixed effects analyses of variance and covariance. *Rev. Educ. Res.*, 42(3): 237-288.
- Godoy RA, Bawa KS (1993). The economic value and sustainable harvest of plants and animals from the tropical forest. Assumptions Hypotheses and Methods. *Econ. Bot.*, 47(3): 215-219.
- Godoy RA, Lubowski G, Anil M (1993). A method for the economic valuation of non-timber tropical forest products. Workshop: Economic valuation and sustainable management of non-timber tropical forest products. *Econ. Bot.*, 47(3): 220-223.
- Godoy RA, Wilkie D, Overman A, Cubas G, Demmer J, McSweety K, Brokaw N (2000). Valuation of consumption and sale of forest goods from a Central American rain forest. *Nature*, 406: 62-63.
- GOS (1999). National Environmental Policy. Ministry of Tourism, Environment and Communications, Government of Swaziland, Mbabane.
- GOS (2001). National Biodiversity Strategy and Action Plan. Swaziland Environment Authority, Ministry of Tourism, Environment and Tourism, Government of Swaziland, Mbabane.
- GOS (2002). National Forest Policy. Ministry of Agriculture and Cooperatives, Government of Swaziland, Mbabane.
- Grundy, I., and Breton, Gus-Le. (1998). The SAFIRE MITI Programme - A New Approach to Natural Resource Management in Communal Areas of Zimbabwe. ODI Rural Development Forestry Network, Network Paper, p. 22e.
- Hall P, Bawa, K.S. (1993). Methods to assess the impacts of extraction of non-timber tropical forest products. *Econ. Bot.*, 47(3): 234-247.
- Hassan RM, Mbuli P, Dlamini CS (2002). Natural resource accounts for the state and economic contribution of forests and woodlands resources in Swaziland. CEEPA Discussion Paper No.4, CEEPA, University of Pretoria, Pretoria, 66p.
- Hedge R, Suryaprakash L, Achoth L, Bawa KS (1996). Extraction of Non-timber Forest Products in the Forests of Biligiri Rangan Hills, India. Contribution to Rural Income. *Econ. Bot.*, 50(3): 243-251.
- Hess P, Forster H, Gwaita-Magumba D (1990). National Forest Inventory of Swaziland results and interpretation. Swazi German Forest Inventory and Planning Project. Report No.5. Mbabane. pp.5
- Lasschuit P (1994). Rural household energy strategies in Swaziland. University of Amsterdam, Interfaculty Department of Environmental Science, Amsterdam, 64p.
- Lasschuit PE (1995). Urban Household Energy Strategies in Swaziland. University of Amsterdam, IVAM Environmental Research, Amsterdam, 81p.
- Nibbering JW, Samyn JM (2002). Integrated participatory forest management in a densely populated mountain region, NWFP, Pakistan. Proceedings of the Research Course "The Formulation of Integrated Management Plans (IMPs) for Mountain Forests" Bardonecchia, Italy-30 June-5 July 2002.
- Prasad, R. (1999). Joint forest management in India and the impact of state control over non-wood forest products. *Unasylva*, 198(50): 58-62.
- Qureshi MH, Kumar S (1998). Contributions of common lands to household economics in Hiryan, India. *Environ. Conserv.*, 25(4): 342-353.
- SAS (1999). SAS/STAT User's Guide, Version 8, 1st printing, Volume 2. SAS Institute Inc, SAS Campus Drive, Cary, North Carolina, 2: 27513.
- Shackleton CM (1996). Potentail Stimulation of Local Rural Economies by Harvesting Secondary Products: A case Study of the Central Transvaal Lowveld, South Africa. *Ambio* 25(1): 33-38.
- Shackleton CM, Shackleton SE (1997). The use and potential for commercialization of veld products in the Bushbuckridge Area. DANCED-Community Forestry Project in the Bushbuckridge Area, Department of Water Affairs and Forestry, 104p.
- Shackleton CM, Shackleton SE (2000). Direct Use Values of Secondary Resources Harvested from Communal Savannas in the Bushbuckridge Lowveld, South Africa. *J. Trop. For. Prod.*, 6(1):28-47
- Shackleton CM, Shackleton SE (2002). Household wealth status and natural resource in the Kat River valley, Eastern Cape. Unpublished

- report, Rhodes University, Grahamstown.
- Shackleton CM, Shackleton SE (2004). The importance of NTFPs in rural livelihood security and as safety net: a review of evidence from South Africa. *South Afr. J. Sci.*, (100): 658-664.
- Shackleton CM, Shackleton SE (2006). Household wealth status and natural resource in the Kat River valley, South Africa. *Ecol. Econ.*, 57(306): 317- 307
- Shackleton CM, Shackleton SE, Ntshudu M, Ntzebeza J (2002). The Role and Value of Savanna Non-Timber Forest Products to Rural Households in the Kat River Valley, South Africa. *J. Trop. For. Prod.*, 8(1): 45-65.
- Shapiro SS, Wilk MB (1965) An Analysis of Variance Test for Normality (complete samples). *Biometrika*, (52): 591-611.
- Sreedharan CK (2002). An Integrated Approach to Conservation of Forests with Development of Villages in Tamil Nadu. A paper presented at the IUFRO Science/Policy Interface Task Force regional meeting held in Chennai, India at the M. S. Swaminathan Research Foundation, 16-19 July.
- Wild CP (2004). Commercial products from the wild [on line]. www.cpwild.co.za, March 25th.
- Wily LA (2002). Participatory forest management in Africa. An overview of progress and issues. Draft report.