

Conceptualizing the human use of wild edible herbs for conservation in South African communal areas

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Abstract

The importance of wild edible herbaceous species to resource poor households in most rural economies within savannas has been little studied. This is because most of the herbs grow in impoverished species communities and lands, often referred to as 'marginal lands'. The aim of this paper is to conceptualize how the economics of wild edible herbs to households can be used to add value to total livelihoods and conservation within traditional communal areas of South Africa. Analysis of the economics of the consumption of wild edible herbs in Thorndale (Bushbuckridge district) of the Limpopo province is presented. The majority of households consumed wild edible herbs, averaging 15.4 kg dried weight per household per year and valued at \$167 per household. The herbs were mostly harvested from uncultivated areas of farms, and rangelands. There was little correlation between household characteristics and the dependence on wild herbs for food. The local people noted a decline in the availability of the species, although not much is known about attempts to cultivate them. The only reasons attributed to the decline were nutrient poor soils and insufficient rains. With this background, developing a local strategy to sustain the species through cultivation by households was found to be feasible. A multiple-use system for the herbs, their improvement and value addition towards commercialization and increased household usage may result in wider acceptance and subsequent cultivation. Species diversity will be enhanced whilst conserving the land on which they grow. This multiple use system may include species roles in soil and water conservation.

1. Introduction

1.1. The benefits of non-timber forest products to rural households

The utilization of wild plants and animals continues to greatly benefit society to this day, from processes mostly involving local experimentation through indigenous and local knowledge ([Johnson, 2000](#); [Kristensen and Balslev, 2003](#); [Ladio and Lozada, 2004](#); [Scherrer et al., 2005](#)). Out of these came the direct dependence of numerous resource-poor households on indigenous plant resources in rural areas of most countries as an integral part of their livelihoods ([Arnold and Ruiz Pérez, 2001](#); [Godoy and Bawa, 1993](#); [Hammett and Chamberlain, 1998](#); [Ladio and Lozada, 2004](#); [Scherrer et al., 2005](#); [Shackleton and Shackleton, 2004](#)). Such dependence is predominant in areas where there are easily accessible communal area resources, in conjunction with limited economic options ([Clarke et al., 1996](#); [Cunningham, 1997](#); [Dovie et al., 2005](#)). The term non-timber forest products (NTFPs) is used in this

paper to generally define 'secondary natural resources' from a given piece of land, coincidental to the primary management objectives, in this case the bush, herbs and trees that are collectively referred to as woodland resources. Examples of the NTFPs are wild edible herbs, wild edible fruits, craft materials, medicinal plants, mushrooms, fuelwood, and construction poles, among several others (see [Campbell et al., 1997](#); [Dovie et al., 2002](#); [Shackleton et al., 2002a](#)). Their role and value are hardly recognized in macro-economic and conservation planning as they are overshadowed by the value of charismatic species. During the ground breaking 'hidden harvests' project, the importance of diverse species referred to as 'lesser-known' in food security was demonstrated over the whole range of rural livelihood systems ([Guijt et al., 1995](#); [Scoones et al., 1992](#)). They are essential sources of vitamins, minerals, carbohydrates and proteins for poor people ([Agrahar-Marugkar and Pal, 2004](#); [Aqte et al., 2000](#); [FAO, 1995](#); [Gockowski et al., 2003](#); [Parvathi and Kumar, 2002](#); [Singh and Garg, 2006](#)).

Besides direct nutritional contributions (e.g., beta-carotene, vitamin C, calcium, and iron), the diversity of wild edible herbs is a source of variety, spice and taste in local meals ([FAO, 1995](#); [Parvathi and Kumar, 2002](#)). Decades of official food security policies worldwide have completely overlooked the importance of most food represented by wild species and harvested from impoverished and agriculturally unproductive lands, herein referred to as 'marginal lands' ([Bell, 1995](#); [Prescott-Allen and Prescott-Allen, 1990](#)). In many cases, this has undermined food security and the conservation of biodiversity at local levels ([Bell, 1995](#); [Scoones et al., 1992](#)), such that these marginal lands are deemed to have little value and so may face external pressure for transformation to seemingly better uses, such as intensive agriculture, residential sites and infrastructural development. The need to treat such ecosystems as unique is key to maintaining biological diversity whilst conserving soil and providing livelihood services. The situation is further aggravated by the fact that not much is known about the cultivation of these wild species in savanna environments.

Subsequent to the contribution of NTFPs as important components of livelihood security and biodiversity, very little is known about the holistic value of wild edible herbs in savanna ecosystems compared to tropical rainforests, hence leaving important gaps in knowledge. A general failure is the limited appreciation of the livelihoods of resource poor rural communities. Thus they are not just about growing cash or staple crops, raising livestock and participating in the mainstream cash economy only, but are tied to a complex network of dependence on non-marketed wild resources that are not captured in macroeconomic analyses. Wild edible herbs or wild leafy vegetables are a part of these resources that are mostly without formal markets. This article therefore is an attempt to show that the sustainable utilization and cultivation of wild edible herbs may provide an effective incentive to conserve agroecosystems and marginal lands and thus will enhance species community structure and composition. The objectives of the paper are to (a) provide an understanding of the value of wild edible

herbs to resource poor rural households using a quantitative analysis, (b) investigate the effects of some attributes of households (e.g., wealth status and population) on usage, and (c) to qualitatively demonstrate the importance of wild edible herbs in conserving species communities, improving impoverished lands, and agroecosystems using a simple 'herbaceous species use—conservation' conceptual model.

1.2. Livelihood and potential conservation roles of herbaceous species

Traditional communal area resources are mostly described as open access, frequently associated with over-utilization and poor management of the natural resources therein. Yet it is those 'unproductive and impoverished lands' that support and supply diverse sources of important biological resources from which local people benefit (Cocks and Wiersum, 2003; Cousins, 1999; Dovie et al., 2002; Shackleton and Shackleton, 2004). Over 90% of resource poor rural households are known to depend on NTFPs in southern African communal areas (Dovie et al., 2002; Shackleton and Shackleton, 2004; Twine et al., 2003). As a result, the daily usage of NTFPs is a significant, yet underestimated component of livelihoods, biodiversity, land use and land cover. This underestimation results from the lack of monetization of the consumption of these resources at the household level, and the lack of formal markets, and hence they are not captured in national level accounting. However, they may account for a considerable proportion of the total biodiversity in natural and subsistence ecosystems.

Of the over 6000 higher plant species in South African savannas (Cowling and Hilton-Taylor, 1994), a wide range is harvested for NTFP purposes (Clarke et al., 1996; Cunningham, 1997; Lawes et al., 2004; Twine et al., 2003). In particular, dozens of plants are used as wild edible herbs, harvested from and around arable fields, communal rangelands, wetlands, and homesteads (Dovie et al., 2002; Shackleton and Shackleton, in press; Shackleton et al., 1998). Several families of plants are used, with the genera *Amaranthus*, *Agathosma*, *Bidens*, *Cleome*, *Chenopodium*, *Corchorus*, and *Vigna* being the most conspicuous (Coetzee et al., 1999; Shackleton, 2003). The amount of wild edible herbs consumed in traditional communal areas of South Africa is known to range from 12 to over 130 kg per household per year (Dovie et al., 2002; Shackleton et al., 2002a and Shackleton et al., 2002b; Twine et al., 2003), with a single household using as many as 21 species (Shackleton et al., 1998). However, not much information exists on the cultivation and domestication of most of these wild edible herbs. The socio-economic status of individual households (e.g., wealth, gender of household head, location of community and culture) could potentially influence the use of wild edible herbs. In the Kat river valley of South Africa, Shackleton and Shackleton (in press) observed that the mean consumption frequency of wild edible herbs per household and per capita was higher for poorer households than richer ones.

In spite of the importance of wild edible herbs in the complex livelihood network that involves extraction from marginal lands and agro-ecosystems, their economic and land restoration potentials are little known. Therefore, the assessment of the value of lesser-known but useful plant species must tally their contributions to biodiversity and conservation and the environment in which they occur. The biggest challenge facing the conservation of wild edible species, just as several other species, is cultivating them *ex-situ*, domestication, and the management practices associated with them. Conservation benefits of herbaceous species may come through the ability of the species to adapt and provide ground cover with the potential to minimize soil erosion ([Roose and Barthès, 2001](#); [USDA, 1996](#)). They may contribute to improving the humus content of the soil through their root systems, and be ploughed to provide green manure in organic viticulture ([Boller et al., 1997](#); [Hofmann, 2000](#); [Roose and Barthès, 2001](#); [Bunch, 2002](#)). Regrettably, herbaceous species well adapted to their local environments and often classified as weeds face replacement with more costly non-endemic species to meet soil and water conservation needs, and having long term repercussions for local species diversity and endemism.

2. Study site

The study site was Thorndale village (31°28'E; 24°39'S), in the Bushbuckridge district of the Limpopo province, South Africa ([Fig. 1](#)), constituting part of the mixed lowveld bushveld vegetation type of the savanna biome. The region experiences prolonged dry conditions annually and extreme drought events at regular intervals. Mean annual rainfall is approximately 550–600 mm, most of which is received between October and April. Thorndale is remote from the major centers of commercial activity and has limited access to social infrastructure. The village is under communal tenure, and bordering the Manyeleti Game Reserve. Access to the reserve for any subsistence use is prohibited. Land is categorized into arable and residential plots (although some parts are cultivated and used for kraals), and residents are allowed free access for grazing and extracting NTFPs in the remaining bushveld vegetation. Hence, land is characteristically open access with no individual title deeds.

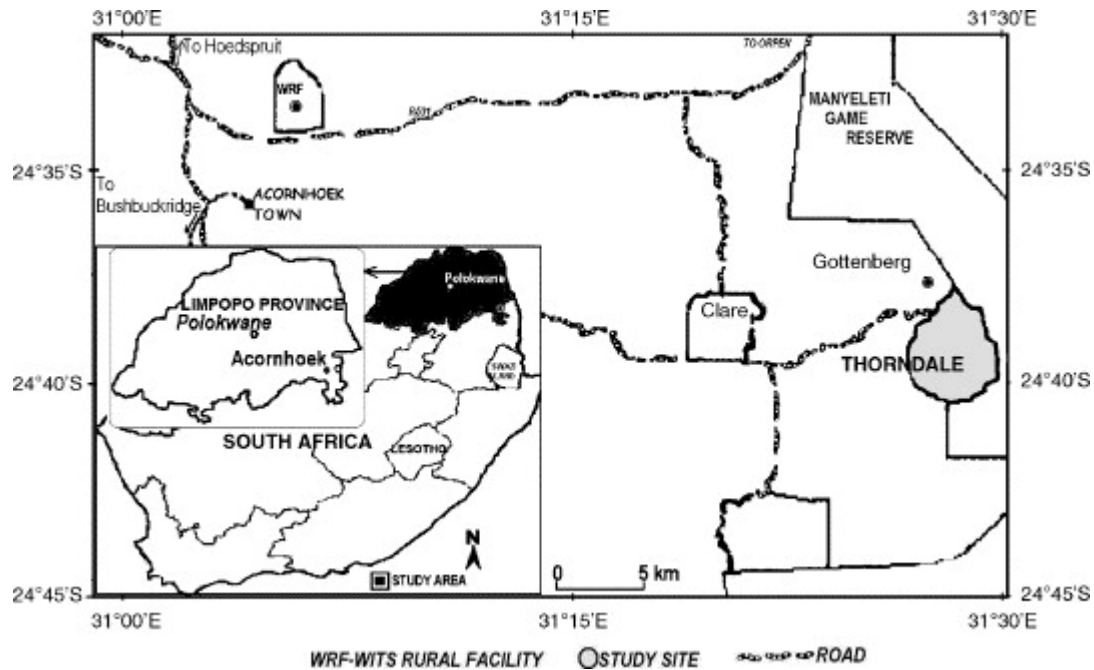


Fig. 1. Map of South Africa and the Bushbuckridge District showing the study site, Thorndale, bordering the Manyeleti Game Reserve. The University of the Witwatersrand Rural Facility (WRF) is an important rural research landmark within the landscape. Map adopted and modified from **Shackleton (2000)**.

Important land uses in Thorndale include crop and livestock production and the harvesting of NTFPs such as fuelwood, thatch grass, construction materials, fruits, wild edible herbs, medicinal plants, bushmeat and reeds. Over 90% of households are involved in the harvesting of at least one type of NTFP (Dovie et al., 2002). Fuelwood, edible herbs and thatch grass contributed 80.6% of the total gross direct-use value of all NTFPs per household per annum. Sixty-four percent of households owned livestock (cattle and goats). Of the 96% of households that cultivated at least a single crop, the majority of them practiced mixed cropping either in home gardens or in fields. The four primary crops were maize (*Zea mays*), groundnuts (*Arachis hypogaea*), watermelon (*Citrullus vulgaris*) and the common bean (*Phaseolus vulgaris*). The mean size of cultivated home gardens was 0.16 ± 0.04 ha per household, ranging from 0.04 to 0.67 ha. The mean size of field plots was 1.7 ± 0.33 ha per household, and ranging from 0.14 to 5.0 ha (Dovie et al., 2005). There were few households involved in off-farm income generation activities (Dovie et al., 2005).

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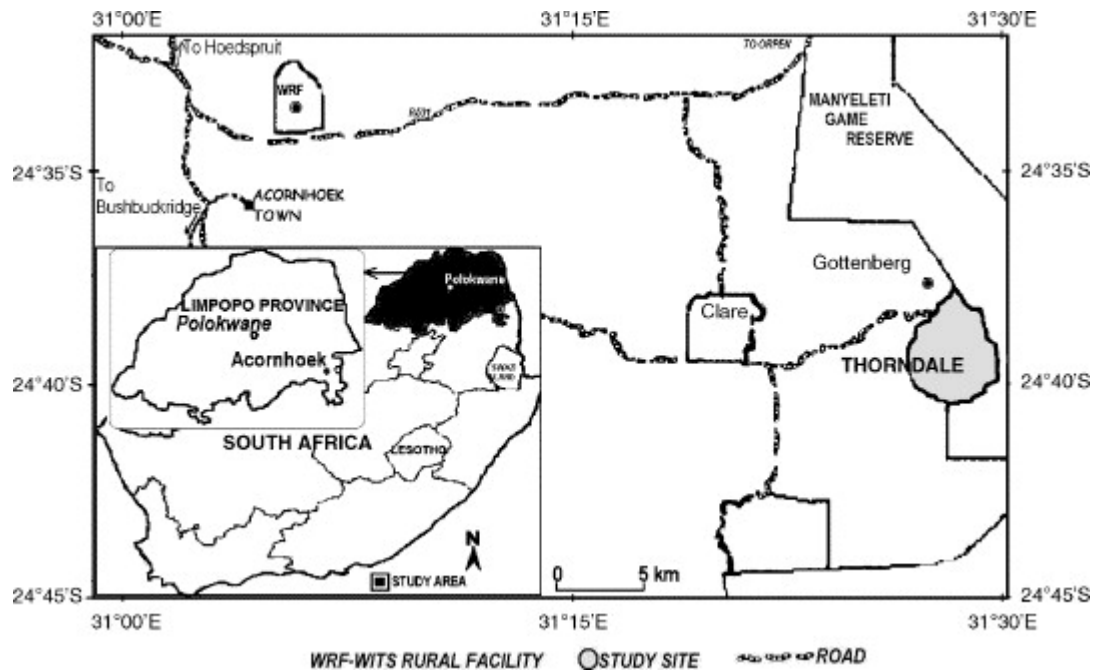


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3. Methods

3.1. Data collection

Individual households constituted the subjects for the study. A sample of 45 households, representing a 63.4% sampling intensity, was randomly selected using an aerial photograph. This followed the allocation of numbers to households on grids derived from the aerial photos, and from which 45 households were selected and subsequently identified on the ground. This was to minimize biases in terms of the characteristics of the households. Several participant observation exercises were carried out prior to the start of the interviews because the principal investigator had spent time in the village doing stakeholder analysis and building consensus. Although household heads were the key elements for the interviews, other members of the household were given the opportunity to participate in the interviews. This was to account for the division of labour and each individual's role within the household. Respondents were exposed to structured and semi-structured questionnaires. Information was gathered on the types and amount of wild edible herbs harvested, rate of collection and consumption, as well as time spent on harvesting. Additionally the use of the herbs was examined in terms of current adequacy, availability in the past and the extent of changes over specified time periods, and issues around management documented. There were no data on cultivated leafy vegetables as the focus was on the wild edible herbs only. However, one household had attempted to domesticate a wild herb (i.e., *Cleome gynandra*: [Fig. 2](#)), although there may be more households, not captured in the study sample.



Fig. 2. The cultivation of the spider-wisp (*Cleome gynandra*) in a home garden in Thorndale, South Africa (Photo: first author).

Household heads more often delegated other members of the household to provide specific information. Additionally, the household interviews were combined with simple participatory rural appraisal (PRA) tools such as product flow diagrams to ease the acquisition of data. This approach is referred to as the hierarchical valuation scheme (Dovie, 2003). Data were collected in the context of all other NTFPs from the woodlands. Profile data from each household were also collected, including information on informal and formal cash income streams via pensions, welfare grants, wages and remittances. The socioeconomic, demographic and livelihood profiles of households were examined and documented. Individuals aged 18 years and over were regarded as adults, with younger members recorded as children. The emphasis of data collection was on household approaches rather than community-level enumeration. This is because the ability of people to develop socio-economic networks in resource use is initiated at the individual household level, which was critical for this study.

3.2. Data analyses

Villagers collected fresh/green wild edible herbs using plastic bowls and standardized cups. Following the work of Shackleton et al. (1998) in the same region, a 1-l bowl of fresh mass of herbs was equivalent to 0.4 l of dried herbs or 27.5 g of dry mass of herbs. Monetary values were calculated in South African Rand and converted to US\$ at a mean exchange rate of US\$1=R6.14. Dried herbs were sold for \$11.84/kg in surrounding villages hence the figure was adopted and used for the computations. The monetary value of wild edible herbs was calculated and summed across all households using the methods of Dovie et al. (2002). The major source of statistical analysis was descriptive statistics. The χ^2 test was used to test whether or not the consumption of wild edible herbs was associated with specific household profiles. The Student *t*-test was used to test the difference between the means of the numbers of households that harvested wild edible herbs from the different patches of localized environments (e.g., arable fields). Spearman's rank correlation (Waite, 2000) was used to examine the fine-scale correlation between household profiles, seasons, and the consumption of wild edible herbs. A one-way analysis of variance (ANOVA) was performed on log-transformed weights of wild edible herbs harvested from various sources, and comparing the differences between their mean weights. The data were first analyzed for (i) homogeneity of variance, (ii) normality, with a plot of raw residuals that showed a normal distribution (log transformed to meet this requirement), and (iii) the absence of outliers, with a plot of the observed species numbers against the raw residual, and thus allowing ANOVA to be performed (Waite, 2000). Unless otherwise stated, all statistics were performed using the program STATISTICA Version 6 (StatSoft Inc., 2002).

4. Results

4.1. Household profile

The mean number of residents per household was 6.3 ± 0.8 , ranging from 1 to 32 persons per household. The number excludes migrant visitors, the majority (64%) of who pay monthly visits. Sixty-four percent of households received monthly migrant visits of 1.6 ± 0.2 persons, staying for 3.9 ± 0.6 days. Households were involved in various livelihood activities (i.e., extraction of NTFPs, livestock and crop production) contributing significantly to household income (Table 1). Values from NTFPs correlated with the values obtained from crops ($r=0.4$, $p=0.01$); livestock ($r=0.31$, $p=0.03$), as well as crops with livestock ($r=0.3$, $p=0.02$). There was a negative correlation between formal and informal cash incomes ($r=-0.6$, $p=0.01$), indicating that households specialize in formal activities at the expense of informal ones. Nearly all (98%) of households harvested and utilized NTFPs from the woodlands (Table 2). These NTFPs (e.g., wild edible fruits, fuelwood, medicinal plants, weaving reeds, housing materials, etc.) were valued at \$559 per household per annum across all households including the non-users. Households owned cattle and goats, and benefits accruing from cattle alone were substantial. Various crops were cultivated, and estimated to yield \$443 per household per annum. The most important of the crops was maize (*Zea mays*), providing the staple meal for all households, and most importantly eaten consistently with sauce prepared from wild edible herbs.

Table 1.

The value of annual livelihood incomes from formal and informal earnings in Thorndale

Livelihood source	Households		Annual income/household (\$)	
	(n)	(%)	Direct beneficiaries	All households
Pensions+grants only	7	15	865±141	133
Informal cash income	18	40	1129±220	452
Formal wages only	27	60	1073±160	644
Formal+pension/grants	32	71	1094±143	777

Table 2.

Selected livelihood activity profiles of households and the proportion of households that were involved in Thorndale

Activity	Proportion of households (%)
Permanent employment	49
Casual employment	18
Cattle ownership	33
Goats ownership	31
Non-livestock households	36
NTFPs/woodland resources	98
Crops (at least one crop type)	87

4.2. Harvesting of wild herbaceous species for food

Herbs are commonly harvested and eaten while they are still fresh during the rainy season. Because they are mostly annuals, large quantities are harvested, dried and stored for off-season use. Prominent among these herbs are the spider-wisp (*Cleome gynandra*), *Cleome monophylla*, pigweed (*Amaranthus hybridus*), small pigweed (*A. thunbergii*), and blackjack (*Bidens pilosa*). The others are wild cucumber (*Cucumis zeyheri*), and *Corchorus tridens*. Individual species may be used in the preparation of meals but more often than not, a mixture is preferred. Ninety-one percent of households harvested and consumed wild edible herbs. The consumption was estimated at 15.4 ± 2.8 kg of herbs per household per annum. The gross monetary value was \$182.9 \pm 33.1 per user household or \$167 across all households per annum. The monetary value per user household constitutes a quarter of the total gross monetary value (\$707) of all NTFPs utilized by user households only, and was the third most important valuable product among twelve NTFP types considered (Dovie et al., 2002).

The mean daily consumption of wild edible herbs was 0.2 ± 0.02 kg per household. Herbs were eaten everyday of the week by 27% of households during the rainy season (November–March/April). Some households (19%) consumed herbs once a week, another 19% on 2 or 3 days a week. Although no households purchased any herbs (fresh or dried) 2.2% of households sold dried herbs to households in a neighboring village. This was done 7 days a week for 2 months within the driest period of the year. This totalled \$18.2 within the period per annum. The opportunity cost for not working on a nearby commercial farm and harvesting herbs was estimated to be \$140.8 per household per annum.

The harvesting of an equivalent of 1 l volume of fresh herbs (~0.03 kg dry weight) took approximately 1 h on a roundtrip by foot. Herbs were harvested from farmers' fields, grazing areas (mainly the woodlands), around homesteads or a combination of these. Of the 91% of households that harvested wild edible herbs, 36% harvested from the woodlands, 29% from farmers' fields, 20% from around homesteads, and 4% concurrently from homesteads and woodlands. Whilst 9% of households did not harvest any herbs at all, 2% of household heads could not account for where herbs were specifically harvested by the other household members. There were no significant differences between the number of households that harvested herbs from farmers' fields and the woodlands, and between those who harvested from the fields and homesteads, and also between those who harvested from the woodlands and homesteads (Table 3). However, there were significant differences between households that harvested from the fields and a combination of homesteads and woodlands. In addition, a significant difference was recorded between harvesting of herbs from woodlands and combined harvesting from homesteads and woodlands. Similarly, there was a significant difference between harvesting from homesteads and the combined harvesting from homesteads and woodlands (Table 3).

Table 3.

Differences between the numbers of households that harvested wild edible herbs from different sources and the extent of these differences

Harvesting sources	t-values	Significance
Arable fields and woodlands	$t_{df=88}=0.451$	$p>0.05^{ns}$
Arable fields and homesteads	$t_{df=88}=0.431$	$p>0.05^{ns}$
Arable fields and (homesteads+woodlands)	$t_{df=88}=3.725$	$p<0.001^{**}$
Woodlands and homesteads	$t_{df=88}=0.975$	$p>0.05^{ns}$
Woodlands and (homesteads+woodlands)	$t_{df=88}=3.257$	$p<0.05^*$
Homesteads and (homesteads+woodlands)	$t_{df=88}=2.293$	$p<0.05^*$

ns: statistically non significant.

*: significant.

** : highly significant.

4.3. Effects of household size, cash incomes, and population structure on consumption

The quantity of wild edible herbs consumed by households positively correlated with household size ($r=0.4$, $p<0.1$), and hence households with more members consumed more herbs. Based on the physical evidence that households consumed wild edible herbs with maize meal the relationship between the two was tested. There was a positive but weak correlation ($r=0.3$, $p<0.1$) between the households that consumed wild edible herbs and the households that cultivated maize. This could mean that an increased cultivation of maize reflected increased use of the herbs. However, no correlation existed between the amounts of wild edible herbs and amounts of maize consumed. Additionally, it was expected that households with higher cash incomes will depend less on wild edible herbs but this was not the case. No association existed between the dependency on wild edible herbs and cash incomes of households ($\chi^2<0.1$, $df=1$, $p=0.9$). Thus, cash incomes of households may not determine dependencies on wild edible herbs. The dependence on herbs by households was not associated with either the presence or absence of children or adults in a household ($\chi^2<1.5$, $df=1$, $p=0.2$). Thus age structure of the household may not affect the consumption of the herbs. Furthermore, there was no association between the consumption of wild edible herbs and the presence or absence of male and female adults in a household.

4.4. Sources of wild edible herbs and availability

The data suggest that greater quantities of herbs (i.e., 17 ± 4.1 kg/household/annum) were harvested from the arable fields followed by the ones that grew in the homestead (12.4 ± 6.1 kg/household/annum) and then the least in the bushveld (11.1 ± 4.7 kg/household/annum). The amounts of the herbs between the three sources did not differ significantly ($F_{(2, 33)}=1.5$, $p=0.2$). The wild edible herbs within the homesteads are tightly controlled by the corresponding households, although some do allow other households to harvest them from time to time depending on the relationship they maintain with the outsider. In such cases, no commitments or conditions were reported for harvesting. The situation in the bushveld and arable areas for harvesting is however open to all households and even on the farms of other households without any permission or commitments from the harvesting household. The majority of households (Fig. 3) noted that the amount of wild edible herbs available for harvesting had decreased relative to the amount available a decade prior to the study (Fig. 3). However, 40% of households were of the opinion that herbs were sufficient for household use in the late 1990s.

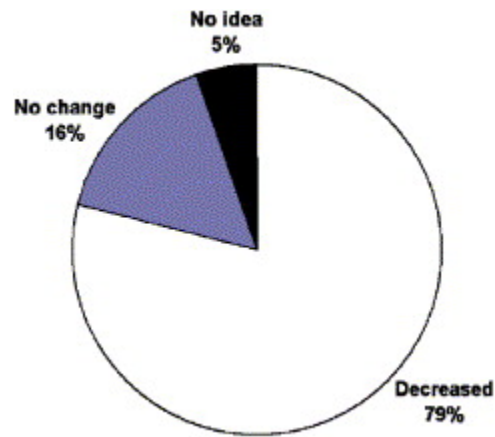


Fig. 3. Household perceptions of the availability of wild edible herbs based on whether there were more or less herbs to harvest compared to the last decade (in the early 1990s) prior to the study.

4.5. Local management opinion of wild edible herbaceous species

In spite of the over 70% of households reporting that they have observed wild edible herbs becoming less available over the years (i.e., [Fig. 3](#)), the majority could not suggest any long-term solution. A few suggested that the species could be planted along the fringes of their farms, home gardens and kraals to provide additional benefits of slowing soil erosion and facilitating easy harvesting access. There was an opinion that most of the edible species help break the pestilence cycles of insects and diseases in a mixed cropping system and hence could be planted and managed amongst crops at prescribed levels and stages of crop production. Notwithstanding that only one household had cultivated a wild herb, cultivation may not be an immediate management option unless accompanied by incentives. This is because households counted the opportunity costs that might be involved in the cultivation unless they are able to derive some level of direct satisfaction other than for soil and species conservation purposes. However, as more farmers have begun to use tractors for ploughing their fields, the people acknowledged that the herbs, if planted on their farms could be ploughed into the soil to fertilize and hold soil particles together. They also thought that if left between ridges on their farms, it would protect the topsoil from being eroded by strong winds and rains. These suggestions came against the background that they do not have sufficient capital to embark on soil conservation and restoration practices. There was a collective opinion that wild edibles should be managed especially because some elderly people indicated that they have, in recent times, hardly encountered some species that they harvested for food

5. Discussion

5.1. The benefits of NTFPs to households, with emphasis on wild edible herbs

The benefits of wild resources to resource poor and deprived households in South Africa are enormous and they can no longer be neglected in national resource accounting, especially from savannas, which constitute the largest biome in the country, and are also home to the majority of the rural population (Shackleton and Shackleton, 2004). Not only are the large areas of woodlands in the savanna important for commercial agriculture and rural settlement of the local population, but the direct-use value of their relatively high plant diversity, to rural households (Dovie et al., 2005). The positive relationships between the land-based livelihood sources (i.e., crops, NTFPs and livestock) are an indication of their concurrent relevance to livelihoods (Cousins, 1999). The absence of any correlation between cash income and the land-based livelihoods mitigates against the use of cash incomes alone to measure rural well-being and hence the poverty level of resource-poor households. As a result, the linkages between individual products and resources cannot be overlooked.

The majority of wild edible herbs eaten typically contain high levels of important nutrients especially for diets usually high in starch and low in proteins (Agte et al., 2000; Parvathi and Kumar, 2002), although there may be toxic effects if the intake exceeds certain limits (see Singh and Garg, 2006). Whilst the herbs are eaten as leafy vegetables, the majority do play an opportunistic or overlapping role as medicinals (Tardío et al., 2005), and hence adding extra value, and thereby making them very attractive and important to the users. Households ate different sauces made from wild edible herbs to accompany meals mainly of ground maize; the most cultivated staple carbohydrate crop. The implication is that efforts geared towards the improvement of the production of maize need to consider strategies to match it with the production and consumption of herbs in resource poor rural communities. Wild edible herbs therefore provide important leafy vegetables for many rural and deprived households and are often available at the time when the season for the cultivated options is over (e.g., lettuce, cabbage). While cultivated species are in short supply during the beginning of the rains, fresh new leaves of wild species are abundant, making it possible for households to continuously access leafy vegetables (Mertz et al., 2001). Households with limited access to cultivated produce such as in Thorndale had to store dried herbs for use during the dry season. This has similarly been reported within the region (e.g., Shackleton et al., 1998).

The relative monetary value of wild edible herbs to households compared to other NTFPs signifies their extent of usage and importance although they may be less in value relative to fuelwood and wild edible fruits. Households that consumed herbs daily were by far the majority. This emphasizes the role of herbs

in the diets of people, similarly reported in other studies (e.g., [Shackleton et al., 2002a](#) and [Shackleton et al., 2002b](#)). If hours used for harvesting herbs were to be used working on nearby commercial farms, the value of farm income would have been lower than that for herbs. Subsequently, should the harvesting of wild edible herbs be commercialized and herbs sold, the opportunity cost for not working on a farm would be lower, and herb traders may earn higher per capita income, but depending on market conditions. This represents a positive development for investigating the dietary benefits and commercialization of the herbs in order to improve the lives of resource poor communities.

5.2. Household characteristics and the dependence on wild edible herbs

There were no differences between the numbers of households that harvested wild edible herbs from microenvironments within and around the village, indicating the importance of the full range of environments ([Table 3](#)). However, whilst herbs are collected from a range of environments, the amounts collected from arable fields tended to be higher than that collected from rangelands. Therefore, households do recognize all these units of land as important sources of the species they harvest and may contribute cultural significance to any management options designed for these lands. The positive correlation between household size and the amount of herbs consumed reinforces the importance of wild edible herbs to food security and livelihoods of resource poor rural communities. High population density may affect wild species and hence impact negatively on the sustainability of the herbs and the systems in which they grow. Although the impacts of population are possible, consumption may be heterogeneous due to the differences in the population sizes of households, as substantiated by the lack of correlation at individual household levels. The consumption of the wild edible herbs could better be described as communal for the bushveld and arable farming areas but not for the homestead. Since the bushveld and the arable areas constitute larger areas of harvesting for the whole community, it is important to make the community a unit of any conservation effort, whilst embarking on stakeholder participation at the household level. The positive relationship between maize meal and wild edible herbs implies that the reduction or increment in the number of households using either wild edible herbs or maize will result in decreased or increased maize meal or wild edible herbs. However, results show that the changes might not be related only to the amount of wild edible herbs or maize consumed but several other factors could be at play.

There was no association between the cash income earnings of households and their dependencies on wild edible herbs. Households that depended on wild edible herbs did so even if they had the financial means to purchase cultivated alternatives. This demonstrates the strong cultural underpinnings of the use of wild edible herbs, which may be a useful foundation for conservation and sustainable use interventions ([Cocks and Wiersum, 2003](#)), although the remoteness of the village from markets that

supply alternative cultivated species must have a role to play. With the lack of formal and on-farm jobs in the communal areas, a number of households are known to derive cash income and remittances from migrant labor for spending on more capital-intensive activities rather than buying commercialized leafy vegetables. The reliance on the wild edible herbs is therefore a reliable safety net and provides households the opportunity to save the little money that they receive from working (e.g., see [Dovie et al., 2005](#)). It also implies that any attempt to promote the use and management of wild edible herbs will be accepted by different households with diverse wealth status. Conversely, [Shackleton and Shackleton \(in press\)](#) reported that rich households depended less on wild edible herbs compared to poor households in some Kat river valley savanna communities of South Africa. The reason for this is twofold; the Kat river valley is less species diverse and hence few options exist to choose from, whilst the majority of the people depend on cultivated leafy vegetables from the rather numerous surrounding farms ([Dovie, submitted](#)). In addition, the communities have easy access to the urban and peri-urban centers for accessing other produce. The present study further shows that no relationship exists between the consumption of wild edible herbs and gender or age classes of households. [Ladio and Lozada \(2004\)](#) have similarly reported this, among a particular population in South America.

5.3. Conceptualizing the conservation role of wild edible herbs

Less than half of households that consumed wild edible herbs indicated that there were sufficient herbs available for harvesting in the year of the study. However, when residents were asked to compare the current availability with the past decade, the majority were in agreement that the herbs have decreased ([Fig. 3](#)). This is not surprising because only one household among the sampled households cultivated a wild herb although there could be more outside the sample. As a result, developing broad base and innovative multiple uses for the herbs, such as for green manure and cover plants may add value and result in increased awareness and some level of cultivation, but it will take a practical demonstration experiment to achieve this goal. Based on the opinions of households on propagation however, and in relation to land, only an incentive based management scheme may suit local conditions ([Fig. 4](#)). Further innovative efforts will be to add value through new meals and food formulation, and embarking on commercial ventures. Better drought tolerance of some wild herbs relative to staple crops should be communicated widely ([Dzerefos et al., 1995](#)).

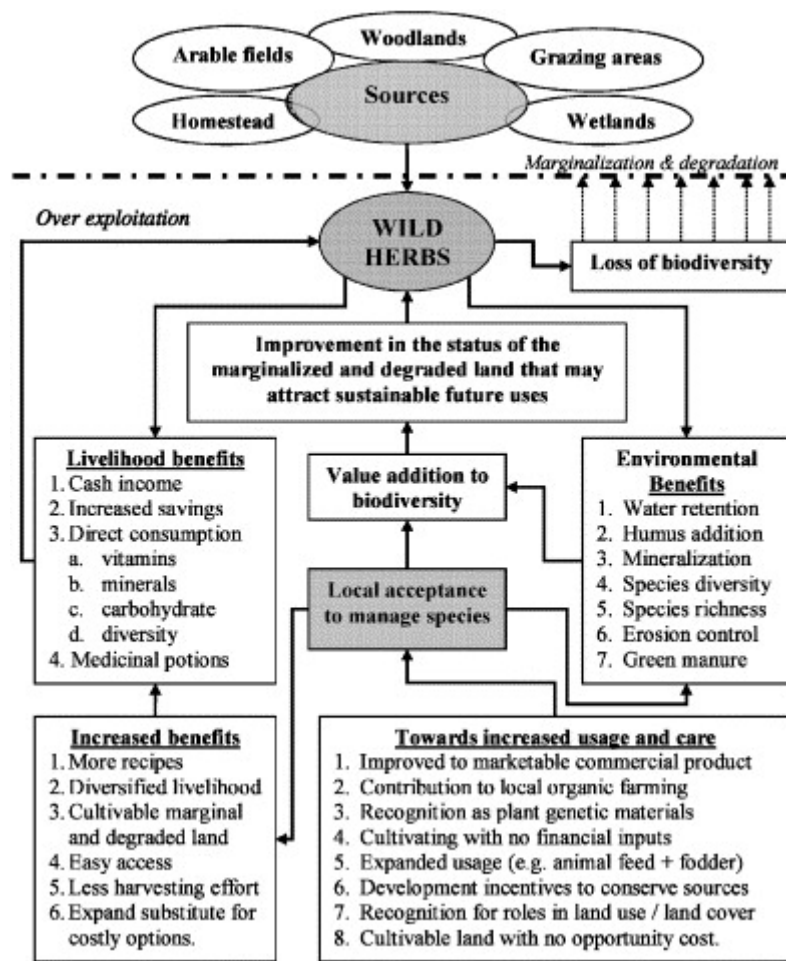


Fig. 4. A conceptual model, translating the benefits derived from wild edible herbaceous species into their management, and conservation of their sources (often neglected and impoverished lands in traditional communal areas of South Africa).

The marginal lands and traditional agroecosystems are important sources of wild edible herbs as observed in this study and can make important contributions to biodiversity conservation (although some species are not indigenous) and food security. This is because traditional agriculture utilizes a wide range of wild species and land races for reliable food supplies, and ensuring the maintenance of local genetic diversity to farmers (McNeely, 1995). Marginal lands should simply be considered parts of agroecosystems that are productive instead of treating them as a separate entity. Maintaining biological diversity is essential for productive agriculture, and ecologically sustainable agriculture is paramount for enhancing and maintaining biodiversity (Pimentel et al., 1992; Wickramasinghe, 1995). In Java, farmers cultivate over 607 crop species in their gardens as part of the broader agroecosystem, with overall species diversity comparable to deciduous tropical forest (Wickramasinghe, 1995). Wild edible herbs in traditional communal areas of South Africa often grow on lands that extend from the immediate

neighborhood of the built area of human settlement to the arable lands and grazing areas and at times in disturbed areas. This has similarly been observed by [Shackleton et al. \(2002b\)](#) in a different savanna area in the Kat River valley of South Africa. They are therefore easily spotted on neglected areas of farmers' fields, where most of the species will generally be considered weeds in agriculture, but on the contrary, they contribute to high species richness and diversity in ecology.

The conceptual model ([Fig. 4](#)) suggests the importance of wild edible herbaceous species to biodiversity and their overexploitation could imply the loss or deterioration in biodiversity or fragmentation of local landscapes. This could also result in the neglect of the environment in which they grow. The units of land may be wetlands, rangelands, arable fields and specific resource use patches ([Fig. 4](#)), which can ultimately be subjected to unsustainable practices such as intensive farming or alien species plantations, irrespective of scale. The model further suggests that although local people are aware of the environmental benefits of plants, a better or improved knowledge and acquisition of skill to do something positive with these benefits will result in local acceptance (e.g., [Parvathi and Kumar, 2002](#)). As the community benefits directly or indirectly, value will be added to biodiversity in areas of species richness and providing favorable habitats for other forms of life, and hence the sustainability of the environments in which the herbs grow ([Fig. 4](#)).

The acceptance and hence the support for promoting the cultivation and conservation of wild edible herbs will depend on potential multiple benefits ([Bunch, 2002](#); [Madge and Jaeger, 2003](#); [Roose and Barthès, 2001](#)), that will require thorough investigation. The preference for wild edible herbs to cultivated leafy vegetables by the rural poor is due to several reasons. These include culture of use, livelihood strategies, and easy access to sources, drought tolerance, and availability in most seasons, type of meal and limited or no financial costs to households. Although the data from this study are not suggestive of the wide range of potential benefits of wild edible herbs, such gaps can be translated into testable hypotheses that, the wide acceptance of wild edible herbs and their improvement in a conservation framework will depend on the following (see [Fig. 4](#)):

- (a) land with low opportunity cost,
- (b) multiple benefits (e.g., leafy vegetables, seeds, fruits and medicine) other than for soil and crop improvement,
- (c) financial benefits,
- (d) cultural benefits

- (e) ability of the species to conductively intercrop with crops,
- (f) negligible or no additional input cost (kind or cash) will be incurred, and
- (g) ensuring the maintenance of local genetic diversity.

6. Conclusions

The monetization of wild edible herbs, which are mostly without formal markets, is key to understanding their value to locally unrecognized economies and hence the networks of strategies used mostly by resource poor households for their livelihoods. The study shows that wide ranges of uncultivated species are used by the majority of households as leafy vegetables. These herbs are harvested and used directly (i.e., direct-use value), by the households and often without any forms of trade especially because the majority of the households often engage in the harvesting within their local environments. The direct-use value therefore represents a reasonable replacement cost for the cultivated alternatives, and offers extra cash savings for the household. Because of these roles, there is the need to enable local support to promote the cultivation and management of the herbs. This will however require the understanding of the local availability of the species, their community structure and composition through a thorough assessment (Gockowski et al., 2003), which this study did not address.

The sound development of a broader role (e.g., value addition through storage and meal type, commercialization, and soil conservation), could probably widen their livelihood base, and draw on the recognition by external stakeholders such as planners and agricultural officers. The extraction of the wild herbs from different areas of the community exhibited in this study implies that there is hardly a 'wasteland' or marginal lands when it comes to the harnessing of plant parts for food. Hence, the areas in which these species occur need not be seen as self-regulating 'wastelands', but productive agroecosystems (Bell, 1995; Daily, 1997). Failure to recognize the value of these environments and the species therein means that they can be subjected to commercial and industrial abuse. This will then undermine the hardly appreciated value of the species they support, and their contributions to food security and biodiversity. Such contributions can only be valuable if the herbaceous species themselves are fully recognized as key elements of biodiversity, and the environments in which they grow also treated as unique areas that deserve to be maintained. Intensification of the wild edible herbs in the marginal areas is required as there are no production or livelihood trade-offs or competitions to grapple with. In the arable areas, semi-intensive production is recommended in a mixed production fashion with crops to avoid any undue competition for resources such as minerals and light, whilst the existing homestead production can be maintained during normal growth seasons and intensified during off-season periods. Any management model (e.g., Fig. 4) that seeks to address these 'least-known'

resources and their environments need to be adaptive, with implementation based on a learning process that involves science, local culture and traditional nomenclature about resource use (Dovie, 2003; Lado, 2004). The impacts of population, poverty, food insecurity and markets, are proximate factors of resource use in local environments and need to be fully captured in resource planning and management. Key localized social issues on household composition and characteristics, gender roles, the history of resource use, the division of labour and trade-offs between other livelihood options need to be understood as components of change, management and sustainability (see Dovie et al., 2005). The conceptual model suggests that the role of household use of wild biodiversity is multi-faceted, and that depending on the socio-economic status of households, different development paths for stimulating continued use of biodiversity is possible. Such development paths will be worth investigating in future research.

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