Western Cape Government

A Review of Wild Plant Harvesting Guideline Type Documents and Relevant Literature

Gillian McGregor and Shirley Pierce Cowling









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EADP 696: THE DEVELOPMENT OF GUIDELINES FOR THE SUSTAINABLE HARVESTING OF WILD HONEYBUSH

Western Cape: Department of Environmental Affairs and Development Planning

Service Provider: Caroline Gelderblom Consulting

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CONTENTS

ACRONYMS & ABBREVIATIONS

ARC	Agricultural Research Council
DEADP	Western Cape Department of Environmental Affairs and Development Planning
MAPs	Medicinal and Aromatic Plants - '…plants used not only in a medical sense but also used as condiments, food or cosmetics
NGO	Non-government organisations
SANBI	South African National Biodiversity Institute
EC DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism

1 AIM OF THE REVIEW

The purpose of creating this review of guideline type documents is to inform the guideline development process. Identifying the typical features of guideline type documents will enable the identification of what makes up sustainable harvesting guidelines. This will guide the process and direction of information gathering for the project

The objectives were set as follows:

- On a broad scale in terms of international advice and policies, identify relevant organizations, documents and authors which deal with wild plant collection;
- On a local scale (i.e. South Africa), identify actual guideline type documents which would be similar to the kind of document required for this process and would be aligned with South African legislation and policy;
- Identify the common characteristics of these guideline documents and draw up a framework which might be suitable for honeybush guidelines.

2 OVERVIEW OF THE MOST SIGNIFICANT RESULTS

A list of 36 points extracted from appropriate guideline documents are presented first. This represents the most significant results of the review exercise. A review of the supporting literature is presented later.

1. There must be an emphasis on replenishing seedbanks for both reseeders and also resprouters. This approach is somewhat obtuse in all other reports but it is absolutely essential that the emphasis is on underground sustainability as well as that above-ground.
2. Harvest must ideally be timed in relation to seed ripeness and its natural dispersal –i.e. after seed release.
3. Guidelines must be species specific and if possible, be variant specific.
4. Guidelines need to account for geographic variation– different areas experience different climatic conditions regarding temperature and moisture regime.
5. Guidelines need to advise on how to adapt harvest according to previous history, including i) previous harvest ii) recent fire iii) previous drought *etc.*
6. Legislation, permitting and advantages of certification need to be communicated.
7. Socio-economic factors need to be considered.
8. 8. Harvest regime highly dependent on specific area and its temperature and moisture regime.
   9. The ideal harvest regime depends on the previous season – a wet season encourages subsequent growth, whereas after a drought, plants may be too stressed and suffer as a result of a badly timed harvest.
10. The age of a newly-established plant must be carefully considered before the next harvest.
11. The regrowth after a previous harvest must ve carefully considered before the next harvest.

12. A harvester needs to know ??? growth spurt to allow plant to build reserves but before leaf shed.

13. The frequency of harvest is dependent on species and type (resprouters or reseeders).

14. The percentage of plant cut must ensure sufficient stems to produce more seed. This is dependent on the species; too much removal can lead to death or reduced regrowth for next harvest. In cut flowers, only 25-50% of flower cut is recommended from a purely biological perspective (Mustart and Cowling 1992.)

9. =15. –In some cases, systematic random cropping is recommended where not all plants in population are harvested.

16. Method of harvesting needs to consider how a plant grows, e.g. all around the bush especially in the case of low growing spreading bushes; avoid tearing if plant growing on rocks.

17. It is important to cut in such a way that surrounding species are not damaged – use pruning shear of a sickle to avoid this.

18. The height of cut is dependent on the plant's history and growth pattern. For plants never before harvested, height must be specified above ground. For previously cut plants, the height above previous cut must be specified.

19. The height of cut has impacts on problems associated with stem size – too low can damage plant and stem diameter may be unsuitable.

20. In cutting, cleaning of field equipment (e.g. with jik) is important to prevent spread of fungal infections and disease.

21. The diameter of a stem must be specified (if too great, the larger surface area exposed increases risk of infection; woody stems blunt cutting blades (expensive) and tea doesn't sweat properly (in traditional processing or initial drying); stem diameter can affect flavour).

22. Ideally, the cut should be angled to drain moisture to avoid fungal infection.

23. Where it is feasible and practicable, it is ideal to manage the fire regime. Fires should not be too frequent, fire intervals will depend on area and its climate regime, e.g. prevent fires from occurring on very hot or windy days, ensure that fires occur during the correct season and note that winter fires are not desirable In terms of biodiversity.

24. Removal of all invasive alien plants which threaten harvest areas Is recommended.

25. Its best to avoid stock grazing especially within first 2 years after fire, as seedlings are vulnerable.

26. There is a need for an environmental management plan for each farm (see Pretorius et al., 2011).

27. There is a need farm mapping and monitoring.

28. It is recommended that areas are identified: "fenced off" into units which are then sequentially harvested to ensure appropriate harvest frequency.

29. It is worthwhile to protect necessary insects for pollination (not sure one does that): e.g. do not spray near wild crops.

30. It is important to protect soils from erosion, especially along paths, tracks etc.

31. Plant material should be transported on cool days to reduce damage.

32. Damage to surrounding fynbos plants must be avoided.

33. It is important to find out if any threatened red list plants are on the land. Be especially aware of protecting them in the veld to be harvested.

34. Possible interest to the honeybush industry is augmentation. Buchu farmers remove the wild seedlings that emerge in between fires to replant in plantations. This is seen as a sustainable practice as these seedlings die from shortage of resources and from being out-competed by other fynbos plants.

35. If seeds are collected and removed for propagation this must be conservative. Seed banks must not be depleted - seeds are valuable. It is better to remove those seedlings which establish in the veld between fires as they more than likely die in summer.

36. The literature recommends between-year "light pruning" of honeybush plants to reduce woodiness and promote fresh shoots.

3 LIMITATIONS OF THE REVIEW

There are very few true 'guideline' type documents that deal with the specifics of sustainable wild harvesting. Those that do exist are either very general, or very specific and are not relevant to wild harvesting in the fynbos. There is a range of documents on resource surveys in other countries, but there are very few for the wild harvesting of African plant species, and even fewer that focus on fynbos.
The review only deals in detail with those documents that are relevant to the development of guidelines for the wild harvesting of honeybush. It deals with other documents in a cursory way.

4 REVIEW OF LITERATURE RELEVANT TO UNDERSTANDING SUSTAINABLE HARVESTING GUIDELINE DEVELOPMENT

4.1 Global literature

There are several papers on similar topics produced by Schippman *et al.* at various dates which deal with issues around wild harvested plant species at a global scale. These plants are designated as 'Medical and Aromatic Plants' (MAPS). The term is defined by Schippman *et al.* 2005 as: '…plants used not only in a medical sense but also used as condiments, food or cosmetics.' Honeybush can be placed in this category since large part of the demand for the tea is as a healthy sweet-tasting beverage, but increasingly it is being sought -after for its 'medicinal' qualities.

In the article by Schippman *et al.* 2005, a table for determining the susceptibility of MAPs to over-harvest is presented. *Plant form* and *plant part used* are presented as measures of susceptibility of species to over collection. Honeybush falls into the plant form categories of perennial and shrub, and the parts used include the wood bark, stem, leaves, flower and seeds. On this scale, honeybush emerges as low to medium susceptibility. This approach is probably not applicable to honeybush which is adapted to a fire-prone ecosystem.

In the same article, some of the advantages and disadvantages to wild harvesting are presented in the table below. It may be useful to consider these points when considering the development of guidelines for the wild honeybush industry.

Advantages	Disadvantages
• it ensures that the maintenance of wild plant populations is in the continuing interest of local people • it provides an incentive to protect and maintain wild populations and their habitats and the genetic diversity of MAP populations	• uncontrolled harvest may lead to the extinction of ecotypes and even species • common access to the resource makes it difficult to adhere to quotas and the pre-cautionary principle • in most cases knowledge about the biology of the resource is poor and the annual sustained yields are not known in most cases. Resource inventories and accompanying management plans do not exist

Much of this paper and a 2002 paper by the same authors on a similar topic, deal with well documented figures of MAP use from the East, Europe and America, but there are no statistics for Africa or South Africa.

In another paper, Schippmann (1997) provides some useful ideas about what to include in a management plan for MAP utilization:

- resource inventory of population abundance and distribution;
- assessment of regional and global threat based on all available knowledge and expertise;
- biological studies (growth and regeneration rates, pollination system, seed dispersal, potential for confusion with similar species, etc.) and assessment of harvest impact on viability of individuals
- assessment of annual sustained yield;
- review of local knowledge and harvest practices;
- review of harvest and trade levels in the past and evaluation of market trends;
- revision of national regulations for the utilization in source country
- assessment of tenure and access;
- design and implementation of management scheme: annual harvesting quota, seasonal or regional restriction and on certain plant parts or size classes, domestication programme;
- installation of continuing monitoring and re-evaluation (adaptive management)

4.2 South African literature

Coming down to a more local context, work done by Shackleton and colleagues over the past 20 years has focused on the use of various wild-harvested products in South Africa and neighbouring countries. They have shown that there is extensive use of a range of products for income generation and for home use in many rural and peri-urban communities. More recent work by Petersen *et a*l, (2012) in a survey based in Cape Town, shows that 70% of all harvested flora are either killed or reproductively harmed in the harvesting process. *Cyclopia buxifolia* and *C. genistoides* are listed in their compendium of 250 harvested plant species. They note the need for an assessment of the resource base and a system of permitting to allow for sustainable use of the species.

There are many of these type of studies which measure resource use and develop an argument for sustainable harvesting guidelines, but those that actually deal with guideline development are

limited. One guideline type document that was produced recently is a resource assessment of *Aloe ferox* brought out by the Department of Environmental Affairs (in 2014).

4.3 Fynbos literature

4.3.1 Introduction

Much research on fynbos plant harvesting has focused on scientific studies on the fynbos flora's ecological features (Rebelo and Homes, 1988; Mustart and Cowling, 1992; Privett et al., 2014) while other investigations have taken a more holistic approach to the industry in considering the socio-economic aspects (e.g. Williams and Kepe, 2008; Pretorius et al., 2011; van Deventer et al., 2015). It has been argued that there is insufficient research on socio-economic aspects, and that harvesting should consider four crucial issues, viz., appropriate legislation, tenure, impacts of cultivation and a transdisciplinary approach towards adaptive management (Williams and Kepe, 2008).

Nonetheless, in alignment with the Project's brief, this section of the project is focused primarily on ecological aspects.

4.3.2 Fynbos characteristics

When developing guidelines for honeybush, it is essential to consider the characteristics unique to fynbos ecosystems and their constituent species. Fynbos vegetation is a fire-prone and fire-driven ecosystem, growing in nutrient-poor soils in regions with a true Mediterranean type climate (wet winters, dry summers) and regions with bimodal (spring/autumn) rainfall. There are two main fire-survival strategies – sprouting and non-sprouting, also known as reseeding. Resprouters have a woody rootstock from which they are able to coppice after a fire. Reseeders are killed by fire and depend on regeneration from the new seedlings emerging from the soil-stored seedbanks. In some species, some populations are sprouters while others are reseeders. These strategies are found in the 23 species of *Cyclopia* (Schutte, 1997).

4.3.3 Persistence of populations is fundamentally dependent on seedbanks

Although fynbos plants are able to regenerate after fire by either resprouting or reseeding (i.e.non-sprouting), fundamentally, both types are totally dependent on adequate stored seedbanks in order for populations to persist. In the case of fine-leaved fynbos shrubs, seeds may be variously dispersed on the soil; others are equipped to be buried by ants. The last-mentioned are described as being myrmecochorous (roughly meaning "carried by ants"). Their seeds have a fleshy external attachment which encourages ants to bury the seeds belowground to feed off the fleshy part. Thus the seeds are buried safe from rodent predation and total destruction by fire. They are often hard-seeded so that the heat from a veld fire causes the hard coats of the buried seeds to crack. This then enables germination followed by seedling establishment in the conducive post-fire conditions. Thus, autumn fires are most beneficial in allowing the young seedlings to survive and establish with the onset of autumn/winter rains.

Jones' report (CEPF, 2004) stands out from all the fynbos guidelines in prioritizing seedbanks and emphasizing that the persistence of ALL plant populations is fundamentally dependent on seed production and seedbank storage. This is regardless of their strategy – seedbanks are just as important for resprouters as they are for reseeding species. However, the general literature seems to give less importance to resprouters' need for adequate seed production and storage. Resprouting plants can also be killed by fire and do not live forever. Ultimately they need adequate seedbanks.

(A useful analogy is that of saving money in a bank against hard times.) It is vital that the importance of seedbank replenishment for all plant types is most strongly emphasized in the guidelines.

4.3.4 Review of literature on fynbos harvesting

This project reviewed the literature available on sustainable harvesting of wild plants in fynbos. There are several reports, theses and scientific publications on various fynbos plant species. These deal with scientific research and also integrate this information with knowledge gleaned from the various industries' stakeholders- including land users, producers, processors and harvesters, conservation officials and conservationists. The industries may be classed as those for cutflowers, rooibos for tea, buchu for oil and honeybush for tea. While each taxon has its own vagaries, generic lessons on guidelines can be learnt.

Caveat

This section of the project aims to survey the literature to determine which factors need to be considered in the honeybush guidelines. The scientific papers are specific about which species or variants are investigated, and whether these are resprouters or reseeders. Unfortunately some of the non-peer reviewed reports provide guidelines that are somewhat general and often the distinction is not made between variants. Therefore, it is not always clear whether harvesting recommendations refer to the reseeder or resprouter species or their variants. In some cases it is not clear if recommendations refer to cultivated plants or those growing in the wild. This can be very important as for some species, wild versus cultivated plants show very different responses to cropping.

4.3.5 Harvesting a range of fynbos species for the cutflower industry

The cutflower industry makes use of a wide range of fynbos plant species. There have been a number of investigations on sustainable practice carried out by the Flower Valley Trust and its partners (Van Deventer et al., 2015). Over the last decade the Trust and its partners have developed comprehensive and well researched outputs for a number of targeted fynbos species. The Sustainable Harvesting Programme was started in 2003 to protect not only the fynbos but also the employment dependent on its well-being. It has leant on several scientific publications (Rebelo and Homes, 1988; Mustart and Cowling, 1992; Privett et al., 2014). The Programme's strength lies in its holistic approach incorporating input from the full range of the industry's stakeholders - land users, harvesters, conservation officials, non-government organisations (NGOs) and scientists. Their work has included rigorous scientific monitoring and in particular, the development of a vulnerability index in order to determine the status of commercially harvested fynbos species (Privett et al., 2014, in prep).

In the final report of this Project, the five honeybush species which are commercially used (Joubert et al., 2011) will be assessed using this **vulnerability index** to provide an overview of the group.

4.3.6 Harvesting of Rooibos (*Aspalathus linearis*) for the tea industry

Most production is from cultivated plants. However, wild harvesting has been covered in much detail – taking into consideration traditional harvesting and socio-economics (Malgas and Oettle, 2007), as well as a wider approach to implementation and sound land management (Pretorius et al., 2011). Rooibos is broadly similar to honeybush, but tends to be limited to the Cedarberg region of the Western Cape. Though its processing is similar to that of honeybush, its leaves, rather than its stems,

are sought for tea production. The following information has been extracted from Malgas and Oettle (2007). It is a small-leaved shrub ranging from 0.5 to 2 m in height although the species' variants differ greatly. Rooibos has two resprouters (rankiestee and bossietee) while both langbeentee and tree type are reseeders. Harvesting of plants older than three years is recommended. The harvest regime is dependent on rainfall and the type of rooibos variant. Flowering of all variants is in October. Most growth is in Sept-April. A harvest in April/May yields more leaves than in the September-November period, so that from December- to April, the mature leaves have time to build plant strength. It is best to avoid leaf shed in late summer/early autumn. (The month of May is possibly too cool if the traditional method of outdoor processing is used.) It is recommended that 50-70% of the plants may be cropped to reduce death. Smaller volumes than this yield better subsequent seed production and a lower risk of fungal and other infections. Cropping of woody stems should be avoided as a high amount of woody material prevents effective fermentation; also the tea quality is reduced. Plants should be cut 2.5 cm above the last cut and stems should be less than 2 mm in diameter. During the first two years of growth livestock should be excluded from eating young plants.

A number of recommendations regarding fire management are described by Pretorius et al. (2011) which follow the general standards for wild fynbos, taking into account season, frequency, local conditions etc.

4.3.7 Harvesting of Buchu (*Agathosma* spp.) for flavouring, pharmaceuticals and cosmetics.

The following information has been extracted from De Ponte Machado (2003) and Jones (2004). Much of the production is harvested from the wild. The biology of buchu, a fine-leaved fynbos shrub is akin to honeybush. However, its leaves are processed in such a way as to yield oil rather than tea. The extraction of oil has implications for methods of harvesting. The three species targeted for commercial use are limited to the mountain slopes of the western fynbos region. These are: the resprouter *A. betulina* - round leaf buchu or bergboegoe; and the two reseeders - *A. crenulata* long-leaf buchu or anysbergboegoe and *A. serratifolia* -kloofboegoe or long-leaf buchu (Jones, 2004).

Research on the plant biology and traditional knowledge has shown that best results are achieved by harvesting three to four years after previous cropping or after a fire. This interval enables the plants to re-establish their carbohydrate reserves leading to increased regrowth and seeding and reduced mortality. Thereafter the frequency of harvesting should be at least every two years. Some stakeholders recommend the more conservative frequency of every three years as flowering and seeding is much greater than for a two year cycle. Young plants which have not yet been harvested show significantly more regrowth than those cropped once per year; the latter have significantly higher death rates.

Of note here and possibly of interest to the honeybush industry, is that buchu farmers remove the wild seedlings that emerge in between fires to replant in plantations. This is seen as a sustainable practice as these seedlings die during the dry summers from shortage of resources and competition from the older established plants.

4.3.8 Harvesting of honeybush (*Cyclopia* spp.) for tea

Apart from the comprehensive review of honeybush (Joubert et al., 2011) and the Agricultural Research Council's (ARC's) pamphlets on cultivation, there is little recorded for wild harvesting of honeybush. Of the 23 species of honeybush, six are of commercial interest (Joubert et al., 2011). A brief mention of traditional harvesting indicates that methods vary greatly (Siyanda et al., 2014).

General recommendations (Jones, 2004) have been summarized here for five of the six commercially used species. These are the resprouters *C. genistoides* – kustee; *C. intermedia* – bergtee; and *C. sessiliflora* – Heidelbergtee, while the reseeders are *C. subternata* – vleitee; and *C. maculata* – Genadendaltee which very occasionally resprouts. (The sixth species of commercial value – *C. longifolia* – Van Stadens tee has only recently become of interest and has populations able to reseed and resprout.) Protection of seed production and dispersal is paramount. A harvest period of four to five years is given and a between-year "light pruning" is suggested to reduce woodiness and promote fresh shoots. The guidelines advise the removal of 50 to 60% of a reseeder's growth every four to five years and up to 80% of greenery from resprouting species. Transport of crops should be on cool days to reduce damage. Mention is made of the collection of seedpods of Heidelberg tea for propagation. The report concludes that further information is needed on season of harvest, viability of seeds, parasites of seed and localities.

5 ASPECTS EXTRACTED FROM THE FYNBOS LITERATURE TO BE INCORPORATED INTO GUIDELINES

From a purely biological perspective, there is concern voiced by eminent biologists (Prof Byron Lamont pers. comm.) that ultimately, in the longer term, repeated harvesting of resprouters means that they are being deprived of their stored resources This may not be perceived in the relative short term of human generations - humans tend to focus on the visible whereas the vital component in the regeneration cycle is the soil stored seed bank. This store is only kept vital by replenishment of the above-ground growth which feeds carbohydrate and nutrient storage and hence seed production. In the absence of very long term monitoring, it is essential that a conservative approach to harvesting of resprouters (and indeed reseeders) is taken in order to ensure the replenishment of soil stored seed banks

It is essential that guidelines must be based not only on ecological knowledge, but also on the needs of the harvesters, the industry's logistics, the processors, compliance officers and the target market. Therefore a range of stakeholders need to make inputs to the guidelines. Knowledge from all these stakeholders needs to be integrated. From a socio-economic perspective, the well-being of the harvesters must be considered, along with the economics of the processing and later production stage. For example, thicker rooibos stems may yield bigger bundles but will prove expensive in damaging blades in the processing plants.

In considering the socio-economic impact of wild harvesting of a fynbos species (i.e. buchu), Williams (2005) makes the following recommendations. New legislation or a review of the current legislation guiding the industry is needed. Better monitoring and evaluation is required as well as opportunities for stakeholders to interact. In particular, effective policy guidelines and an understanding of social dynamics of harvesting should be developed to ensure the sustainability of the resource and the trade.

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