

Discordant Harvest: Debating the Harvesting and Commercialization of Wild Buchu (*Agathosma betulina*) in Elandskloof, South Africa

Authors: Williams, Samantha, and Kepe, Thembela

Source: Mountain Research and Development, 28(1) : 58-64

Published By: International Mountain Society

URL: <https://doi.org/10.1659/mrd.0813>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Samantha Williams and Thembela Kepe

Discordant Harvest: Debating the Harvesting and Commercialization of Wild *Buchu* (*Agathosma betulina*) in Elandskloof, South Africa

Despite the geographic and context-specific nature of the relationship, the strong link between biodiversity use and poverty is acknowledged worldwide.

Biodiversity is seen as both being negatively affected by,

and contributing in the fight against, poverty. *Agathosma betulina* (buchu), a plant growing in the Cederberg Mountains in South Africa, has a global commercial value for use in medicine, food and cosmetics. It is also popular among the poor for the significant cash income it generates for the harvesters. Scientists and conservationists believe that its commercialization will lead to its extinction. However, these concerns are mainly based on scientific studies, with limited perspectives from social analyses. This paper presents the case study of Elandskloof, a mountain communal property farm occupied by poor people, where buchu harvesting is important to local incomes. The paper shows that conflicts among community members and between them and outsiders characterize buchu harvesting. Poverty, the ambiguity of the permit system for harvesting of and trading in buchu, as well as the challenges presented by a common property tenure regime, currently compromise buchu's sustainability. The conclusion is that more social studies are needed, in order to fully appreciate what is needed to ensure sustainability of a high value natural resource in the midst of poverty.

Keywords: *Agathosma betulina* (buchu); natural resources; harvesting; commercialization; South Africa.

Peer-reviewed: May 2007 **Accepted:** August 2007

Introduction

Rural poverty and commercialization of certain natural resources in South Africa are often cited by conservationists as indirect causes of environmental degradation (Sanderson and Redford 2003). On the one hand, over half of South Africa's 47 million people live in poverty, with almost 70% of these living in rural areas (Aliber 2003). Many poor South Africans are, in addition to other things, turning to local natural resources to generate cash (Cousins 1999; Shackleton 2005). On the other hand, as South Africa is the third most biologically diverse country in the world, many indigenous plants are now being commercially produced, for both local and export markets (Wynberg 2002). Precisely due to

the country's importance in terms of biodiversity, as well as the escalating commercialization of its flora, biodiversity conservation has taken center stage in the country's policy and legislative frameworks (Wynberg 2002; Kepe et al 2004; Benjaminsen et al 2006) as well as in academic debates dealing with the environment and poverty reduction. However, the debates on this issue rely mainly on findings in the natural sciences. Social dynamics, particularly within and around areas of high natural resource value, generally receive little or no attention. Yet the scientific findings in these natural science studies are often translated into policy and legislation that affect all resource users in question. Additionally, there are few studies on people–environment issues in mountain environments compared to other landscapes in South Africa.

The present article uses the case of *Agathosma betulina* (buchu) to contribute to the debate about poverty reduction, commercialization, and conservation of natural resources. *Buchu*, a plant traditionally used by local people for medicinal and cosmetic purposes, grows in the Cederberg Mountains of the Western Cape. The article is based primarily on a case study of Elandskloof Farm, whose poor residents communally own a mountain area where *buchu* grows. The case study aims to show how local people's history, income levels, perceptions about sustainability, and resource tenure issues intertwine to present a challenge to the sustainable harvesting and trade of *Agathosma betulina* in the area.

A brief description of research methods used is followed by a review of the socioeconomic importance of *Agathosma betulina* in South Africa. The Elandskloof case study, which mainly discusses the social dynamics of local livelihoods as well as *buchu* harvesting and trade, is presented next. The case study also explores the local dynamics of commercialization of *buchu* through a cultivation project. The final section presents discussion and conclusions.

Methodology

Fieldwork for this study was carried out over 3 months, between 2004 and 2005. To collect data, 52 of the 85 households in Elandskloof were surveyed and analysis was limited to obtaining frequencies on a number of issues, including sources of income, involvement in *buchu* trading, amounts harvested, and people's perceptions about sustainability of the *buchu* industry—including from biological and economic points of view—to mention a few. Secondly, several meetings, including one-to-one encounters with individual community members, focus group discussions, and larger community meetings were used to gain information and insights on a range of issues that are not easy to quantify. Thirdly, a number of key individuals working for the

Agricultural Research Council, Elsenburg Agricultural College, Western Cape Nature Conservation, and various distillers were interviewed in person or via E-mail and telephone. Finally, secondary literature—including policy, legislation, and historical documents—was used to understand broader contextual issues.

Socioeconomic importance of *Agathosma betulina* in South Africa

Agathosma betulina is one of the most prominent endemic plants in South Africa to have global commercial value. It is endemic to the fairly dry Cederberg Mountains of the Western Cape in South Africa. Agriculture in the Cederberg Mountains is limited by altitude, dry climate, and rocky terrain. These unfavorable conditions have, over time, encouraged significant commercialization of mountain vegetation, including *rooibos* tea, protea flowers, and *buchu*. However, with a large number of endemic species, this mountain vegetation is mainly protected, making its commercialization a potentially contested issue.

The value of *buchu* lies in its high oil content, for which it is of use in medicine, food, and cosmetics (van Wyk et al 1997; ICS 2006). South Africa is a key supplier of *buchu* oil to other countries (Coetzee 1999). About 300 tons of wet *buchu* are harvested annually, with over 250 tons destined for export after being distilled into oil (ICS 2006). These figures are based on what is processed by the distillers. While there are no accurate statistics on how much is actually removed from the wild, perhaps due to alleged illegal harvesting, Agricultural Research Council scientists have argued that “The demand for *buchu* exceeds the supply by far” (ARC 2006, p 1). One ton of wet *buchu* produces one kilogram of oil (Hoegler 2000). It is estimated that the industry is worth about R 150 million a year (R 7.00 = US\$ 1) (CapeNature 2006), with producers getting between R 30 and R 60 per kilogram of wet *buchu*. Under Cape Nature Conservation Ordinance 19 of 1974, a permit is needed to harvest or trade with *buchu*. For harvesting, the permit costs R 250 and is good for a season, usually 1 year. The permit is issued for a defined part of a geographical area, after an inspection of the land by the Department of Nature Conservation. After harvesting, *buchu* is sold to distillers, who extract the oil and process it into several products.

Due to increased commercial demand and despite strict legislation on its harvesting, there is a widely held view that wild *Agathosma betulina* is under threat on a number of fronts. Conservationists believe that wild *buchu* could become extinct within the next 5 to 10 years (de Ponte 2002). They cite destructive harvesting practices as the main threat (Coetzee 1999; Hoegler

2000; CapeNature 2006). These practices include uprooting of the entire plant, poor cutting procedures, and over-harvesting or harvesting at the wrong times of the year. The other major concern is alleged theft or poaching from private or protected environments of *buchu* by poor people (Hoegler 2000; CapeNature 2004).

Even though some of the problems associated with the increased commercialization of *buchu* are socioeconomic in nature, arguably the majority of studies undertaken on this crop in South Africa have focused on the technical and biological aspects. For example, for several decades studies have sought to understand the reproductive aspects (de Ponte 2002), chemical composition (Kaiser et al 1975; van Beek et al 1996), and the oil yield of the plant under different growing conditions (Worth 2008). While these studies are important, there is evident neglect of the social dynamics of *buchu* harvesting and trade by both the wealthy and the poor. Also relatively absent from the debate is socioeconomic analysis of different stakeholders, especially harvesters who come from disadvantaged backgrounds. Yet a major undertaking to cultivate *buchu* as a response to alleged threats is underway in South Africa, and is receiving heavy government support as a possible way to help in the fight against poverty in the areas concerned (Coetzee 1999; CapeNature 2004, 2006). The case study of Elandskloof is intended to foster understanding of socioeconomic issues relating to the *buchu* trade in South Africa.

The Elandskloof case study

Elandskloof is situated in a catchment area in the Cederberg Mountains of the Western Cape Province, 200 km from Cape Town and 20 km from the town of Citrusdal (32°00′–32°45′ S and 18°50′–19°25′ E; Figure 1). It is a farm of 3138 ha, including 2420 ha of mountain area (Anderson 1993). Most of the inhabitants are descendants of the Khoi and San people who lived in the area for centuries. In 1961, due to apartheid laws, black residents of Elandskloof were forcibly removed and the land was given to white farmers (Anderson 1993). The post-apartheid government has allowed people who lost their land during apartheid to reclaim it. Hence, under the terms of the Restitution of Land Rights Act 22 of 1994, Elandskloof was restored to its rightful owners in June 1996. The 85 households formed a Communal Property Association (CPA) as a juristic person, in whose name ownership of the land was registered. The CPA allows for the development of a constitution and establishment of a committee responsible for the duties of administering the farm. The term of office for this body is 2 years. However, since the return of the farm to its owners, Elandskloof

the people identified the economic value of *buchu* via trade as most important, as opposed to its domestic use for cultural and health purposes.

Given the high economic value of *buchu* for local inhabitants, it is important to understand the dynamics of harvesting, in terms of who can and does harvest, as well as how and how much. As *buchu* is a common pool resource, all local people have the right to harvest it, with outsiders excluded. In terms of gender breakdown, 69% of the harvesters and traders are male.

Before harvesting begins, a community meeting is called by the CPA committee. Here the starting date for harvesting, safety issues, and the details of the distiller who is going to buy produce are discussed. The starting date is determined by the permit allocated by the government, which is good for one season but does not state the amount that can be harvested. Prospective harvesters are required to contribute R 5 towards the cost of the R 250 permit. Individual households harvest anything from 10 to more than 60 kg per day (Figure 2). People spend about 10 days per season harvesting, with harvests of between 100 and 600 kg per household per season.

Harvesting activity usually takes place during the months of December, January, and February, and normally lasts several weeks. There are only 2 exceptions to this agreed harvesting period. First, when *buchu* is intended for domestic consumption, people are allowed to harvest the small amounts they need throughout the year. Second, individuals can make a request to the committee to allow them to harvest outside of the recommended periods if they have a special reason; this does not involve the government permit. However, residents claim that an increasing number of people either harvest for trading purposes before the agreed time or continue harvesting long after the official harvesting season.

Competition among harvesters is very high, especially on certain sites known for producing good *buchu*. Hence some of the harvesters often take days off from their formal jobs during harvest time. Additionally, to gain an advantage, some local harvesters bring in outsiders to help them collect *buchu*, either as paid laborers or as business partners. This practice causes conflict among the locals, as some people feel that it constitutes an unfair advantage and also obscures one of the most important common property tenets—the exclusion of outsiders.

Local perceptions of threats to the sustainability of *buchu*

Given the widespread argument by conservationists and some scientists that wild *buchu* is under threat from harvesters—particularly the poor—local people were asked about their own views of this threat. The

FIGURE 2 Harvesting of *buchu*. (Photo by Samantha Williams)



majority of people questioned (87%) admitted that they had heard about concerns regarding the threat to wild *buchu*, including its imminent extinction. The respondents acknowledged that *buchu* harvesting in their area was indeed threatened, with 80% indicating that they noticed a decline in the amount available in the previous 5 years or so. However, contrary to prevailing wisdom among scientists and conservationists, according to which unsustainable harvesting practices are the major threat (Coetzee 1999; Hoegler 2000; CapeNature 2004), mountain fires topped the local list of threats, with 42% of the respondents agreeing (Table 1). This was followed by theft and unsustainable harvesting at 31 and 27%, respectively. *Buchu* poaching was observed to be less of a threat within Elands-kloof. However, people admitted that there was occasional stealing, as well as a problem with people from outside using their local connections to come to the farm to harvest. According to local people, the scale of theft, however, is not of any major concern with regard to the sustainability of *buchu*. Regarding unsustainable harvesting as a threat, respondents argued that the frequency, amount harvested, and methods used for harvesting are important but of limited concern to them. However, almost all the respon-

TABLE 1 Threats to wild *buchu* as perceived by local users.

Perceived threats	Responses
Fire	22 (42%)
Theft	16 (31%)
Unsustainable harvesting practices	14 (27%)
Total	52 (100%)

dents claimed that if the future of *buchu* were really threatened, in the sense that it would not be available in future, they would be concerned. Unfortunately, local people are not always aware of the scientific studies that currently point to declining and possible future decline in the productivity of wild *buchu* (de Ponte 2002).

Local marketing dynamics

The actual process of marketing *buchu* from the farm faces many challenges. First, harvesters have a limited understanding of the *buchu* market beyond the farm. Other than knowing that there are outside buyers who come to Elandskloof to purchase *buchu* for distilling, the majority of harvesters (71%) knew little about marketing issues. This limited understanding of the marketing process has a potentially negative effect on price negotiations between harvesters (represented by the CPA) and distillers, as the locals may not understand the basis for the agreed price. Similarly, if local people have a limited understanding of the commodity chain, they are unlikely to know how to do things differently in order to improve the value they derive from *buchu* in terms of the price at which they sell.

Second, the marketing process is challenged by conflicts that emerge during the weighing of the bags at the point of sale. Some harvesters are accused of adding stones or mixing their *buchu* with *vlieëbos* (fly-repellent bush that resembles *buchu* in appearance) to add weight to their bags. When this is discovered in one or more bags, the buyer often treats most of the harvest with suspicion, and may at times lower the price to make up for any undetected deception.

Buchu cultivation

As mentioned earlier, one widely proposed solution to the perceived threat to wild *buchu*'s existence is its cultivation (Coetzee 1999; CapeNature 2004, 2006). It is hoped that cultivation will prevent the present practice of over-harvesting of wild *buchu*. The most publicized reason for initiating *buchu* cultivation projects, though, is the potential to alleviate poverty or contribute to business development in poor areas. However, poor people were not the first ones to venture into *buchu* cultivation. Private commercial farmers in the Cederberg area, who are relatively wealthy, started cultivating *Agathosma betulina* and *A. crenulata* about 5 years ago and have harvested once during this time. In short, the economic viability of cultivated *buchu* is not yet fully understood, nor is it proven that current practices benefit the poor.

Nevertheless, cultivation of *buchu* at Elandskloof (Figure 3) came about in the form of a poverty alleviation project that has several partners, including the Western Cape Nature Conservation Board (WCNCB), a

FIGURE 3 Cultivated *buchu* in Elandskloof. (Photo by Samantha Williams)



local distilling company, the government agency Agricultural Research Council (ARC), and an overseas donor. The community of Elandskloof is only one of several pilot projects for this initiative in the area. The pilot project in Elandskloof began in 2004, with 8 households whose selection was based, among other things, on the suitability of their land for *buchu* growing and the availability of skilled labor. This selection of only 8 pilot households from a total of 85 has caused numerous local conflicts, as well as conflicts between locals and outside partners in the project. The fact that most of the pilot households are either members of the executive of the CPA or relatives of members, or regarded as an elite by other villagers, further fuels discontent among the rest of the community of Elandskloof.

Despite this conflict, there is general local optimism about the potential of cultivated *buchu* to make a major contribution in the fight against poverty. But there are also fears that extensive cultivation of *buchu*, especially by commercial farmers who own large tracts of land, could lead to lower prices for local harvests as a result of oversupply. Given that there has been no harvest from the cultivated crop yet, and since only 8 farmers are involved in Elandskloof, the future of both cultivated and wild *buchu*, particularly in terms of biological and economic sustainability, remains unclear.

Discussion and conclusion

Agathosma betulina is clearly a high-value resource. However, the need for new economic opportunities to help fight poverty in post-apartheid South Africa, as well as increasing global demand for and concerns about the biological sustainability of *buchu*, call for a better understanding of the *buchu* industry. The case of Elandskloof has revealed that there are at least 4 crucial issues con-

cerning *buchu*: legislation, tenure, cultivation, and future research.

Firstly, as policy and legislation applicable to the *buchu* industry are primarily based on Conservation Ordinance 19 of 1974 (as amended), there is a need to review the current permit system for harvesting. There is now widespread belief among those involved in the industry and among conservationists that permits should be issued on quantity-specific terms rather than by season. This would be no different from what is currently done in the fishing industry in South Africa, whereby a Total Allowable Catch (TAC) quota system is used to limit how much fish can be caught. Additionally, rather than relying on threats contained in legislation and policy documents, the state needs to have more visibility at the point of harvest. This visibility is likely to offer protection for the rural poor against unscrupulous distillers, as well as protection for private landholders against poachers. More specifically, we suggest that capacity building by the state, which would include sustainable harvesting methods and business training for disadvantaged *buchu* harvesters, could go a long way in addressing current concerns by both conservationists and those concerned about addressing poverty issues. Additionally, the rumored possible establishment of a state-controlled distillery could help eliminate current problems between communal harvesters and private distillers, let alone the possible influence on the price paid to producers as a result of competition.

Secondly, issues relating to natural resource ownership are another key aspect that this study has found to be complicated. Two issues are important here. The first is that, because many of the current concerns about “unsustainable harvesting” of *buchu* revolve around perceived poaching by the poor from private farms or protected areas, there is a need to consider ways in which a range of resource users gain rights to resources and the legitimate claims they make over them. Given that *buchu* “poaching” has now been going on for decades, it is clear that labeling certain categories of users as illegal has not helped. The second issue concerns the incompatibility of land tenure regimes with current policy and legislation. Policy and legislation on *buchu* harvesting and trade continue to assume the existence of only 2 land tenure systems under which *buchu* is harvested—state land, in the form of protected areas, and private commercial farms in the Cederberg area. New land tenure categories, such as common property, which has been in existence in Elandsbloof only since 1996 following the successful land claim, call for more flexible policy and legislation as well as broader understanding of history and local livelihood prac-

tices. Besides these 2 points, new tenure systems such as the one in Elandsbloof bring with them new challenges, such as exercise of power by powerful members over weaker members of the community. The fact that *buchu* is a high-value resource only exacerbates the opportunities for exercise of power. Additionally, despite much new land reform legislation (eg the Communal Property Association Act), the rights to natural resources on land are often unclear. This fuels many conflicts between resource users and points to a need for the government to address this issue in all legislation concerned with natural resources.

Thirdly, cultivation of *buchu* as a response to high levels of poverty and threats to wild *buchu* calls for caution. Three issues are relevant here. First is the fact that there could be a problem of oversupply in future. Second, as commercial farmers who have vast amounts of land cultivate *buchu* on a large scale, there is a possibility that the poverty reduction rationale of *buchu* cultivation could be called into question, as the bulk of the production could come from those who are not the target of poverty reduction. Third, with cultivation of *buchu* possibly eliminating the concern over sustainability of *buchu*, careful consideration must be given to policies and legislation that need a total overhaul. Both wild and cultivated *buchu* harvesting require a permit, but as *buchu* is protected flora, wild *buchu* permits must be paid for. It is a challenge to distinguish among these types after they have been harvested.

Lastly, there is concern with regard to research on *buchu*. Currently, there is a heavy reliance on natural science to provide answers to problems associated with the sustainability of natural resource use. While the outcomes of science-based studies are important for determining quantifiable results, social dynamics and local knowledge—the importance of which have been emphasized here—are currently neglected. For example, in a strongly-worded article targeting anthropocentric environmentalism, Foreman (2006) reprimands ecologists and conservationists for abandoning ecocentrism. He argues that the current trend of accommodating social science views is effectively weakening conservation. Similarly, du Toit et al (2004, p 12) call on ecologists to be “more assertive in providing scientifically formulated and adaptively managed interventions” instead of relying on community-based strategies. These are clear examples of threats to a holistic view to conservation and development. We argue that it is the responsibility of the state as policymaker and of researchers as creators of new knowledge to see that the broadest possible understanding emerges from studies that affect people’s livelihoods.

ACKNOWLEDGMENTS

The authors gratefully acknowledge financial support from the South Africa–Netherlands Research Programme on Alternatives in Development (SANPAD), and comments on an earlier draft by Hanne Svarstad and Moeniba Isaacs, as well as by the two anonymous reviewers for the journal. The authors are responsible for the published text. Thanks also go to the MRD Editorial team for their kind assistance with the map.

AUTHORS

Samantha Williams

Environmental Evaluation Unit, University of Cape Town, Private Bag, Rondebosch, 7701, South Africa.
Samantha.Williams@uct.ac.za

Thembela Kepe

Department of Geography, University of Toronto, 1265 Military Trail, Toronto, Ontario, M1C 1A4, Canada.
kepe@utsc.utoronto.ca

REFERENCES

- Aliber M.** 2003. Chronic poverty in South Africa: Incidence, causes and policies. *World Development* 31(3):473–490.
- Anderson M.** 1993. *Elandsloof: Land, Labour and Dutch Reformed Mission Activity in the Southern Cedarberg, 1860–1963* [BA thesis]. Cape Town, South Africa: University of Cape Town.
- ARC [Agricultural Research Council].** 2006. *Biotechnology Boost for Indigenous Crop*. Stellenbosch, South Africa: Agricultural Research Council.
- Benjaminsen TA, Rohde RF, Sjaastad E, Wisborg P, Lebert T.** 2006. Land reform, range ecology, and carrying capacities in Namaqualand, South Africa. *Annals of the Association of American Geographers* 96(3):524–540.
- CapeNature.** 2004. Rural community to benefit from the exportation of fynbos crops. *CapeNature*. <http://www.capenature.org.za/index.php?fArticleId=398>; accessed on 24 July 2007.
- CapeNature.** 2006. Empowering people to cultivate *buchu*. *CapeNature*. <http://www.capenature.org.za/index.php?fArticleId=28>; accessed on 24 July 2007.
- Coetzee C.** 1999. *Buchu commercialization: South Africa. Sharing Innovative Experiences* 7:1–5.
- Cousins B.** 1999. Invisible capital: The contribution of communal rangelands to rural livelihoods in South Africa. *Development Southern Africa* 16(2):299–318.
- de Ponte M.** 2002. *Is Buchu Harvesting Sustainable? Effects of Current Harvesting Practices on Biomass, Reproduction and Mortality* [MSc thesis]. Cape Town, South Africa: University of Cape Town.
- du Toit JT, Walker BH, Campbell BM.** 2004. Conserving tropical nature: Current challenges for ecologists. *Trends in Ecology and Evolution* 19(1):12–17.
- Foreman D.** 2006. Take back conservation movement. *International Journal of Wilderness* 12(1):4–8/31.
- Gophe M.** 2005. Restitution of land has not brought prosperity to owners of Elandsloof. *Cape Argus*, 29 October 2005, p 5.
- Hoegler N.** 2000. Plight of *buchu* underscores the need for international herb development. *HerbalGram* 50:16–17.
- ICS [International Centre for Science and High Technology].** 2006. *Agathosma betulina* (R.J. Bergius) Pillans. *Database on Important Medicinal and Aromatic Plants*. http://www.ics.trieste.it/MedicinalPlant/_MedicinalPlant.aspx?id=7; accessed on 24 July 2007.
- Kaiser R, Lamparsky D, Shudel P.** 1975. Analysis of *buchu* leaf oil. *Journal of Agricultural and Food Chemistry* 25(3):943–950.
- Kepe T, Saruchera M, Whande W.** 2004. Poverty alleviation and biodiversity conservation: A South African perspective. *Oryx* 38(2):143–145.
- Sanderson SE, Redford KH.** 2003. Contested relationship between biodiversity conservation and poverty alleviation. *Oryx* 37(4):389–390.
- Shackleton SE.** 2005. *The Significance of the Local Trade in Natural Resource Products for Livelihoods and Poverty Alleviation in South Africa* [PhD thesis]. Grahamstown, South Africa: Rhodes University.
- van Beek TA, Collins NF, Graven EH.** 1996. Chemical composition of the essential oils of *Agathosma betulina*, *A. crenulata* and *A. betulina* × *crenulata* hybrid (*buchu*). *Journal of Essential Oil Research* 8:223–228.
- van Wyk B, van Oudtshoorn B, Gericke N.** 1997. *Medicinal Plants of South Africa*. Pretoria, South Africa: Briza Publications.
- Worth Z.** 2008. *Key Social and Biological Factors to Consider for Policy Guidelines for Sustainable Harvesting of Wild Agathosma betulina in the Cedarberg Region of the Western Cape Province of South Africa* [PhD thesis]. Cape Town, South Africa: University of Cape Town.
- Wynberg R.** 2002. A decade of biodiversity conservation and use in South Africa: Tracking progress from Rio Earth Summit on Sustainable Development. *South African Journal of Science* 98:233–243.