

THE ROLE OF BUCHU (Agathosma betulina & Agathosma crenulata) CULTIVATION IN LIVELIHOODS AND CONSERVATION

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ABSTRACT

Increased management through domestication is the predicted, and often necessary, commercialisation outcome of a wild resource which is subject to a demanding market that promotes competition amongst producers and the depletion of wild stocks. This has been the case for commercial buchu (*Agathosma betulina* and *Agathosma crenulata*), a historically wild collected plant which has been cultivated on a large-scale in selected areas of the Western Cape Province of South Africa. Buchu is an endemic, aromatic shrub around which a lucrative industry spanning diverse and distant markets has developed. Alongside its medicinal properties, buchu is primarily valued for its essential oil which is exported for use in international flavour and fragrant industries.

The aim of this study was to conduct an overview of the local buchu industry with a focus on how cultivation has impacted on the general trade, the different actors involved and the conservation of the plant. A shift in buchu production to large-scale, agricultural enterprises raises certain questions for the involvement of rural harvesters in the trade, especially with regard to their inclusion and the sharing of benefits arising from commercialisation. Accordingly, this research sought to identify the social and economic impacts of buchu cultivation while also exploring the environmental impacts associated with large-scale farming of the plant. The methods employed in this research were primarily qualitative, based on semi-structured interviews conducted with key actors involved in the buchu trade, including harvesters, farmers, industry representatives and environmental authorities.

The study revealed that while the harvesting of buchu is an important economic activity for harvester communities, the cultivation of buchu has played a limited role in local livelihoods with cultivation mainly being confined to large-scale, commercial operations in the hands of wealthy farmers and private processing companies. The findings of this research also shed light on the shortcomings of national access and benefit-sharing legislation which has failed to secure commercial benefits for the rural poor involved in the trade. From an environmental perspective, the cultivation of buchu has contributed to the conservation of the plant in the wild through offsetting harvesting pressures experienced by wild populations, but has also contributed to the destruction of naturally occurring vegetation.

The results of the study show that the buchu trade epitomises internationally traded commodities which are characterised by erratic market conditions and accompanying price fluctuations. Findings call for improved transparency and communication as well as stricter enforcement of regulation to ensure the overall sustainability of the trade and contribute to ongoing efforts to understand the role of biodiversity commercialisation in achieving both developmental and conservation goals.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARC	Agricultural Research Council	
ABS	Access and Benefit-sharing	
BABS	Bioprospecting, Access and Benefit-sharing	
CBD	Convention on Biological Diversity	
CFR	Cape Floral Region	
CLM	Cederberg Local Municipality	
CSIR	Council for Scientific and Industrial Research	
CWA	Cederberg Wilderness Area	
DAFF	Department of Agriculture, Forestry and Fisheries	
DEA	Department of Environmental Affairs	
EIA	Environmental Impact Assessment	
IFEAT	International Federation of Essentials Oils and Aroma	
IUCN	International Union on the Conservation of Nature	
NGO	Non-Governmental Organisation	
NKC	National Khoi-San Council	
NTFP	Non-timber Forest Product	
SANBI	South African Biodiversity Institute	
WCD	West Coast District	

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

South Africa is one of the most biodiversity rich nations in the world. Wild resources contribute significantly to the country's economy and support the livelihoods of many South Africans either through direct-use or as a source of income (Shackleton & Shackleton, 2004; Shackleton, 2005). An increased awareness of health, lifestyle and environmental issues around the globe has seen the natural product and organic industry develop into one of the fastest growing industries. South Africa is in the privileged position to tap into this ever-expanding global market owing to the country's high level of endemism, agronomic potential and high research and technological capacities (Brown et al., 2008; Makunga et al., 2008; DST, 2013). The country's rich indigenous knowledge system also offers the unique opportunity to unlock exclusive offerings for the market (DST, 2013).

Most importantly, capitalising on current market opportunities provides a way to improve the lives of the poor and disadvantaged (Shackleton, 2005; Brown et al., 2008; Shackleton & Pandey, 2014). Accordingly, state, research and industry partners have been collaborating to develop a national industry centred on biologically-based products that can compete internationally (DST, 2013). The development of local biological resources that are considered to be of high value not only aids in reaching social objectives of empowerment and job creation but can also create the incentive to conserve biodiversity.

Some observers, however, have called for a cautious approach when considering the commercialisation of biodiversity as a possible strategy for solving issues situated at the people-environment interface (Arnold & Ruiz Pérez, 2001; Wunder, 2001; Ros-Tonen & Wiersum, 2005). Enterprises based on the extraction of resources are notoriously unstable due to resource base limitations and changing market influences (Belcher & Schreckenberg, 2007; Banjade & Paudel, 2008). This is illustrated by the local buchu industry that has experienced significant fluctuations since buchu was introduced to the international market in the 19th century.

Buchu (the main commercial species being *Agathosma betulina* and *Agathosma crenulata*) is an aromatic plant endemic to the Western Cape Province. Buchu has a long-standing history of traditional medicinal use among the indigenous San and Khoi people and is still used for health purposes within the country (Moolla & Viljoen, 2008). Aside from its known medicinal properties, buchu is mainly valued internationally for its oil content which finds application as a fragrant and flavourant in the food and cosmetic industry. The soaring price of buchu in the late 1990s saw wild populations experiencing considerable harvesting pressure (de Ponte Machado, 2003). At this time it was believed that buchu's increased commercialisation and accompanying social challenges were compromising the sustainability of the plant in the wild (De Ponte Machado, 2002; Coetzee, 2004; Williams & Kepe, 2008). In response to concerns of resource depletion, along with attempts to increase production to meet growing market demand, efforts arose to domesticate the plant on a large-scale (Coetzee, 2004). Such efforts included the implementation of a number of cultivation initiatives aimed at empowering local communities to benefit from the growing trade (Coetzee, 2004).

Since then the buchu trade has shifted from being primarily based on the wild collection of the plant to an agricultural production system. The implication of this shift is the main interest of this study. While cultivation can relieve pressure from wild resources and provide the opportunity to alleviate poverty through local economic development, such efforts are accompanied by novel challenges. For example, an increase in cultivated sources may result in a shift in beneficiaries, increased privatisation and the destruction of natural habitat (Schippmann et al., 2006; Belcher & Schreckenberg, 2007).

Whether the cultivation of buchu has had positive impacts on the conservation of the plant and local economic development or whether cultivation has contributed to the existing problems faced by the buchu trade requires further investigation. The broader question also remains what buchu's true socio-economic value is to local livelihoods as a commercially important plant with high conservation value.

1.2 AIMS AND OBJECTIVES

The main aim of this study is to investigate the commercial trade of buchu, focusing on the effect of changes in NTFP production and positioning cultivation in relation to the different stakeholders and benefits stemming from commercialisation. In particular, the social and environmental impacts brought upon by buchu cultivation are examined in order to determine the role of cultivation in rural livelihoods and the conservation of the two commercial species, so as to contribute towards a more equitable and more sustainable buchu trade.

The study has five main research objectives to reach the stated aim. Objectives one, two, three and four are empirical in nature and are:

- 1. To explore the contemporary history of the dynamics between buchu harvesting and buchu cultivation
- 2. To identify the different actors involved in the buchu trade
- 3. To investigate the policy and market contexts
- 4. To gain an understanding of the extent to which buchu is being cultivated in the Western Cape

Objectives 4 and 5 are analytical in nature and are:

- 5. To determine the socio-economic impacts of buchu cultivation in relation to the different stakeholders and benefits stemming from commercialisation.
- 6. To explore some of the environmental issues surrounding buchu cultivation

1.3 RESEARCH RATIONALE

Locally, calls are increasingly being made for the cultivation of indigenous plants to relieve harvesting pressure on wild populations (Brown et al., 2008; Makungu et al., 2008). Accordingly, a number of community-based conservation programs, many that incorporate cultivation, are being implemented throughout South Africa that aim to benefit communities involved in the trade and commercialisation of indigenous plants. Whether the twin goals of conservation and development are being reached within the sector has not undergone much investigation (See however, Nel et al., 2007; van Niekerk & Wynberg, 2012). A study by Wiersum et al. (2006) on medicinal plant cultivation in the Eastern Cape concluded that even though cultivation as a tool for conservation and poverty alleviation should not be taken "light-heartedly" such a strategy can have a positive outcome if considered within the broader livelihood and cultural context.

Annual revenues from sales of buchu were last estimated to be R150 million (Williams, 2005). However, despite its lucrative status and supposed declining resource base, very little information is available on the commercial management of the plant. The majority of studies on buchu has focused on its phytochemistry and pharmological properties (Collins et al., 1996; Lis-Balchin et al., 2001; Moolla, 2005; Moolla & Viljoen, 2008) or on biological and

conservation aspects (Hoegler, 2000; De Ponte Machado, 2002; Coetzee, 2004). Markedly, socio-economic issues around the commercialisation of buchu have been neglected. Williams (2005) and Williams & Kepe (2008) reported on the socio-economic aspects of buchu harvesting. The research showed that the buchu trade is fraught with challenges exacerbated by poor communication and conflict among role-players and called for more social studies to aid in the current threatened sustainability of the plant.

A better understanding of the dynamics within the buchu industry is necessary to determine the potential implications of cultivation, especially since it is increasingly forming a part of the plant's commercialisation strategy. Thus far, no studies have focused on the cultivation aspects of buchu. However, Makunga et al. (2008) expressed concern over buchu distillers in the Western Cape that are expanding to include cultivated plants. This is worrying for harvesters and small-scale farmers who are reliant on the supply chain and who cannot afford to invest in cultivation or processing technology. Furthermore, the success of state-initiated buchu cultivation projects involving local communities has not been assessed and reported on.

The National Bio-Economy Strategy of South Africa (DST, 2013) calls for the co-operation of industry, government and research institutions to extract value from local biodiversity products that are globally competitive in an effort to better the lives of local people. Efforts to unlock the value of this indigenous plant must coincide with research into the socio-economic context in order to determine its true potential. Results stemming from this research will not only aid in the sustainable trade of the plant but lessons learnt can be applied to similar local industries and ultimately inform future policy formulation.

1.4 STRUCTURE OF THE DISSERTATION

This dissertation consists of seven chapters. This introductory chapter, **Chapter 1: Introduction,** is followed by **Chapter 2: Literature Review**. Chapter 2 provides the context for the study. A review of existing literature mostly draws upon research situated within the Non-timber Forest Products (NTFPs) literature. The first section discusses the role of NTFP commercialisation in reaching both global conservation and development objectives by outlining the challenges and opportunities of market-related strategies for the sustainable development of natural resources. An examination of the domestication of a wild resource as a strategy for commercialisation follows, which includes an introduction of the conceptual model by Homma (1992) for economies based on the extraction of wild products. Buchu as a natural resource is then introduced through outlining the plant's botanical characteristics, natural distribution and medicinal properties. The chapter concludes with a summary of the legislative and policy environment of the buchu trade.

Chapter 3: Methodology and Study Area, provides an outline of the research methodology employed in the study and accompanying limitations as well as a description of the study area.

The initial results of the desktop study, key informant interviews and semi-structured interviews are presented in **Chapter 4: The Local Buchu Trade**. The chapter recounts the buchu trade by exploring the contemporary history of harvesting and cultivation as influenced by market changes. This chapter provides a breakdown of the industry through the identification of the prominent role-players involved in the plant-to-product chain and the market environment in which they interact. Lastly, buchu as a resource for rural livelihoods is discussed.

Chapter 5: Socio-economic and Environmental Impacts, continues with the presentation of the main findings of the study. The first section highlights the key socio-economic impacts the increased cultivation of buchu has had on rural livelihoods. The second section highlights some of the apparent environmental implications of buchu cultivation and what cultivation means for the ecological sustainability of the plant.

Chapter 6: Discussion addresses the main findings of the study by examining the implications of buchu cultivation and placing the findings in a broader research context. The first part of the discussion looks at the role of the cultivation of buchu in rural livelihoods and the value of buchu to harvesting communities in general. Then, buchu cultivation as a conservation strategy is discussed. Lastly, the buchu trade is compared to Homma's (1992) model of extractive economies, as referred to in chapter two.

Chapter 7: Conclusion and Recommendations draws the dissertation to a close by summarising the arguments laid out in the dissertation and suggesting future actions necessary to ensure the sustainable trade of buchu.

CHAPTER 2: LITERATURE REVIEW

2.1 BIODIVERSITY COMMERCIALISATION

2.1.1 Opportunities, challenges and pitfalls

Poverty alleviation and biodiversity conservation are both high on the global sustainable development agenda (Agrawal & Redford, 2006; Roe et al., 2010). The view that the creation of market incentives to promote the sustainable use of natural resources can potentially marry conservation and development objectives has contributed to the increased commercialisation of biodiversity (Arnold & Ruiz Pérez, 2001). Consequently, a critical mass of literature on the opportunities, challenges and shortcomings of biodiversity commodification has emerged over the last two decades (Dove, 1994; Ruiz Pérez & Arnold, 1996; Neumann & Hirsch, 2000; Arnold & Ruiz Pérez, 2001; Belcher et al., 2005; Belcher & Schreckenberg, 2007; Shackleton & Pandey, 2014).

It is widely acknowledged that wild-harvested products, or what are commonly referred to as non-timber forest products (NTFPs)¹, play a significant role in the livelihoods and welfare of the poor globally (Belcher et al., 2005; Shackleton, 2005; Shackleton et al., 2011b). NTFPs contribute to health and food security through subsistence use or serve as a source of income from sales of natural products. It has been found that in instances where commercialisation does not threaten subsistence needs, earnings, although often small, are an important source of cash income to especially the poorest rural households (Shackleton, 2005; Marshall et al., 2006; Angelsen et al., 2014). The use and sale of NTFPs also serve as a "safety-net" during times of hardship (Shackleton & Shackleton, 2004; Wunder et al. 2014). While the key role of NTFPs in enhancing rural livelihoods is well recognized, findings suggest that income from NTFPs rarely plays a significant role in lifting people out of poverty (Shackleton & Shackleton, 2005; Van Niekerk & Wynberg, 2012). Thus, observers have warned against regarding biodiversity trade as the panacea to solving developmental issues situated at the people-environment interface, calling for a more cautious approach within the commercialisation discourse (Arnold & Ruiz Pérez, 2001; Wunder, 2001; Ros-Tonen & Wiersum, 2005).

¹ The most widely known definition for NTFPs is "all biological materials other than timber which are extracted from forests for human-use" by De Beer and McDermott (1989). A broader "working" definition has since evolved to include any biological products harvested by humans from any landscapes of which benefits from use accrue to local livelihoods and well-being (Shackleton et al., 2011a)

A key part of the debate is whether NTFP trade in fact creates "poverty traps" as the extractive market environment keeps production prices low, contributing to persistent poverty within rural communities (Wunder, 2001; Ros-Tonen & Wiersum, 2005; Belcher et al., 2005; Belcher & Schreckenberg, 2007). Furthermore, the significance of financial benefits from NTFP sales in rural livelihoods is very susceptible to changes in the demand for products (Belcher & Schreckenberg, 2007; Banjade & Paudel, 2008). Natural products intended for the health, food and cosmetic industry are especially fickle and "faddish." Unpredictable market trends mean that prices of products may differ greatly from season to season providing an unreliable source of income. This is highlighted in a case study in Nepal where commercialisation initiatives amongst rural farmers were unsuccessful when appropriate markets were unavailable for their product (Banjade & Paudel, 2008).

The biggest concern within the NTFP literature is that benefits derived from increased commercialisation often do not reach the intended beneficiaries (Dove, 1994; Belcher & Schreckenberg, 2007; Wynberg et al., 2009; van Niekerk & Wynberg, 2012). The poorest - who are generally the most reliant on natural resources - often lack the necessary skills, funds and relevant technologies to benefit from the opportunities presented by growing markets. Increased commercial trade may thus shift access and control of a resource to external role-players, disrupting rural economies to the detriment of the poor. Dove (1994) warns that the creation of NTFP markets for development can indeed be counter-productive if the proper conditions such as property rights and tenure are not secured in order to empower the poorest to exploit markets. When market values are attached to natural resources powerful "elites" that are better equipped to manage the resource will capture the benefits (Dove 1994). There is also the possibility that increased commercialisation could hold unintended social implications (den Adel, 2002; McHardy, 2002; Shackleton & Shackleton, 2005). If local arrangements are not considered in commercial activities, subsistence-use, social structure and cultural traditions could be impacted, leaving communities worse off.

Arnold and Perez (2001) and Belcher et al., (2005) echo the concern that the commercialisation process is not without risks for livelihoods but also draw attention to the conservation rationale. Commercialisation does not guarantee the conservation of a wild resource as market pressures may promote over-exploitation. If proper management measures are not in place the depletion of the resource may result in the marginalisation of the poor who depend on it for subsistence needs. This is exemplified in Indian forests where market

pressures are resulting in resource depletion together with the exploitation of forest dwellers by traders (Rasul et al., 2008).

2.1.2 Cultivation as a strategy for commercialisation

The domestication of a wild resource is the usual response to intensify production for a demanding market that promotes high competition among producers and resource depletion (Homma, 1992, 1996; Belcher & Schreckenberg, 2007). Apart from removing harvesting pressure from wild populations, the cultivation of wild products holds a number of economic advantages. Domestication provides the opportunity to increase the yield and production period of a product, offering a faster turnover and reduced production costs (Shackleton et al., 2003; Leakey et al., 2005). Cultivated products also often have more market appeal due to the opportunity for better quality control and certification (Leakey et al., 2005). In contrast, in the case of medicinal plants, cultivated specimens are often regarded as inferior to naturally growing plants either due to cultural connotations or because of biochemical factors in wild populations that are believed to enhance medicinal properties (Schippmann et al., 2006; Wiersum et al., 2006). For example, the medicinal properties of plants are frequently attributable to the presence of secondary metabolites that are produced to increase the fitness of the plant in nature and may not be expressed under cultivated circumstances (Schippmann et al., 2006). Nevertheless, domestication provides the possibility of selecting for sought-after characteristics specific to market demand under better controlled conditions (Leakey, et al., 2005; Schippmann et al., 2006).

From a livelihood perspective, the shift in control of a natural resource away from the poor becomes more likely when the commercialisation of a resource reaches the stage of domestication (Homma, 1992, 1996; Belcher & Schreckenberg, 2007). First, cultivation is a resource-intensive process hindered by constraints such as access to water for irrigation, sophisticated technologies, relevant skills and financial resources (Leakey et al., 2005; Wiersum et al., 2006; Brown et al., 2008). Such requirements may prevent especially the rural and landless from participating in, and profiting from cultivation efforts (Belcher & Schreckenberg, 2007). Second, even if these constraints are overcome small-scale farmers are often unable to compete with large-scale producers in competitive markets resulting in the benefits of commercialisation being captured by commercial farmers and big business instead of local traders and rural farmers (Belcher & Schreckenberg, 2007). Lastly, increased domestication of a natural resource runs the risk of a decreased market-share of wild

harvested products (Belcher & Schreckenberg, 2007). If the cultivated product is preferred by buyers, producers who still harvest the product from the wild could be disadvantaged.

In contrast, domestication can secure new economic opportunities for the destitute and provide a more steady income in comparison to the labour required for wild extraction which is typically seasonal (Homma, 1996). Leakey et al., (2005) are of the opinion that together with sound policies and strong indigenous rights, increased commercialisation through market-orientated domestication can hold positive outcomes for development. This is evidenced by the domestication of indigenous fruit trees in parts of West and Central Africa that has enhanced the livelihoods of poor farmers (Leaky et al., 2005).

Despite being widely promoted as a conservation strategy, cultivation is not without environmental consequences, especially if market demand promotes large-scale monoculture production systems. Agriculture as a type of land-use activity remains one of the leading causes of environmental destruction around the world, including deforestation, biodiversity loss and land degradation (Foley et al., 2005). Oil palm plantations in South-East Asia (Fitzherbert et al., 2008) and rubber plantations in China (Qiu, 2009), both of which were formerly collected from the wild, are two highly publicised cases that have caused mass destruction of natural forests. Indeed, cultivation has been critised for being a counteractive conservation tactic as the domestication of a resource will decrease the value of the wild resource and result in the loss of incentive to conserve wild populations. This may lead to more destructive land-use developments that are economically advantageous (Homma, 1996; Schippmann et al., 2006). For example, former rubber tappers in Brazil have shifted their livelihood strategies from NTFP extraction to agriculture and cattle farming after a decline in the demand for rubber (Salisbury & Schmink, 2007). Furthermore, cultivation has been criticised for being ecologically unfavourable as the domestication of a species fails to conserve genetic diversity. During the domestication process only certain individuals with desired traits, such as high yield, will be planted resulting in the reduction of the genepool (Schippmann et al., 2006). There is also the possibility of the introduction of unwanted genetic material from cultivated sources into wild populations which may have evolutionary consequences, especially if cultivated sources have been genetically modified (Ellstrand, 2003).

2.1.3 Wild product extraction as an economic model

Conservation and development models based on the extraction and sale of wild resources have been critiqued for being inherently unsustainable (Homma, 1992; 1996; Richards, 1993; Crook & Clapp, 1998; Wunder, 1999). "Extractive economies" do not act in isolation but are sensitive to a number of social, ecological, political and, particularly, economic factors which render them unstable. Accordingly, commercial enterprises based on wild resources have been commonly associated with "boom" and "bust" phases as products fluctuate in economic value according to market influences which accelerate depletion of the resource base and do not allow for significant economic benefits to be realised (Crook & Clapp, 1998).

Environmental and social concerns related to wild resource production systems have been largely informed by the widely recognised economic model of Homma (1992) based on Amazonian forest plant products. Homma (1992) argues that with intensified wild extraction in response to commercial demand, cultivated or synthetic sources will ultimately replace the natural resource in replenishing the market. This is because, given the limited resource base, disequilibrium between supply and demand will increase prices and, subsequently, encourage the development of economically more feasible alternatives. The end result is the decreased value of the wild resource and a depleted natural resource base. Whether wild populations survive the period of intensive harvesting depends on the type of extractive process i.e. whether harvesting is destructive to the resource or not (Homma, 1992).

The economic cycle of wild resource "extractivism" is depicted in Figure 1 (Homma, 1996). According to the model, the development of wild resource extraction is typically characterised by four phases, 1) expansion, 2) stabilisation, 3) decline and 4) cultivation. First, the extraction of a wild resource increases when commercial demand emerges. During the stabilisation phase a balance between supply and demand is reached close to the supply capacity of the resource base. Then, the price of the product starts to rise as depletion of the resource impacts on the quantity supplied and extraction cost and production is unable to meet market demand. With growth in demand and inelasticity of supply, the scarcity of the resource leads to the domestication of the wild product, the development of synthetic alternatives or the shift to a different wild product. Finally, wild extraction is abandoned as alternative sources satisfy the market.



Figure 1: The NTFP production cycle, adapted from Homma (1996)

The duration of these phases differs from product to product within different socio-economic and regulatory environments. However, if the wild resource has high economic value and the potential market growth exists, attempts at domestication will be inevitable as it overcomes the limited stock provided by nature and the associated problems with supply. The only reason for domestication to be hindered is if the necessary technologies are unavailable, if domestication is too costly compared to wild extraction or synthetic substitutes, or if a specific market is captured for the wild product, for example labelling it as "green" or "natural" (Homma, 1992, 1996). If not, the foreseeable result of NTFP commercialisation is a change of production system from small-scale wild harvesting to one of extensive agricultural production, the implication of which is the loss of livelihood and conservation benefits associated with wild harvesting (Homma, 1996).

Despite the model's substantiation in the context of open access forest systems, it cannot be concluded that predicted consequences of NTFP commercialisation are inevitable. The model assumes that NTFPs can be cultivated or substituted and that any management interventions are futile. Case studies, however, have shown that a wide range of outcomes can be realised for different resources, across different ecological systems and institutional settings (Nieumann & Hirsch 2000; Shackleton, 2001; Kusters & Belcher, 2004; Shackleton & Pandey, 2014). Indeed, a systematic review of global NTFP literature (2000-2010) by Stanley et al., (2012) revealed that nearly two-thirds of research reported that the extraction of wild

resources was sustainable or likely to be so. Furthermore, proper management interventions and institutional measures can also circumvent the conservation and livelihood issues associated with the domestication of a wild resource (Kusters & Belcher, 2004; Leakey et al., 2005). Almeida (1996) points out that the harvesting of a wild product is often one of multiple sources of revenue for households thus a decline in market demand need not result in a drastic change to livelihoods.

2.1.4 Research approach

It is clear from the literature that the use and management of commercial NTFPs is an activity involving a complex interaction of people, markets and natural resources. During the production and trade of NTFPs, a number of social, economic and environmental variables merge in the market chain favouring some actors over others, or affording more importance to financial gains than environmental consequences. While the expansion of production systems is accompanied by a growth in market opportunities, there is little evidence that all involved will benefit equally from these changes. This research attempts to address this issue of benefit distribution by examining the consequences of changes in NTFP production and positioning cultivation in relation to the different stakeholders and benefits stemming from commercialisation.

An important starting point is thus identifying the actors involved and understanding the market and policy context, both past and present, which embraces them. Central to the analysis is the impact that the shift to cultivation has on the livelihoods of the rural poor as often marginalised participants of the NTFP market chain. An analysis of accompanying social and economic impacts will serve to assess the role of cultivation in rural livelihoods. This study does not make use of specific social, economic or environmental indicators but approaches the analytical identified in an exploratory manner. The advantage of this approach is that impacts and their relations to different actors are not predefined but rather emerge during the empirical analysis and take into account the impact of contextual factors which influence production and trade. Accordingly, socio-economic impacts take on a broad definition and evolve with the analyses as critical issues are identified. Another important thread is the role of cultivation in conservation. The study acknowledges that social, economic issues and environmental issues into the investigation.

Homma's (1992) economic model provides the conceptual basis to assess cultivation's role in the commercialisation of a NTFP. This research will not attempt to prove or disprove Homma's model but rather to utilise it in an attempt to understand whether prominent environmental and social concerns related to wild resource production systems depicted in the literature hold true for buchu production.

2.2 THE RESOURCE

2.2.1 Ecological characteristics

South-Africa is home to 150 buchu species of the *Agathosma* genus (Moolla & Viljoen, 2008). For the purpose of this study the word *buchu* refers to the two species of commercial relevance: *Agathosma betulina* (Bergius) Pillans and *Agathosma crenulata* (L.) Pillans. It is noteworthy, that a genetically distinct hybrid species, more closely related to *A. betulina*, has also been established as commercially important (Hüsselmann, 2006).

Buchu is a perennial shrub that belongs to the Rutaceae (citrus) family (Goldblatt & Manning, 2000). The plant has woody branches and small aromatic leaves that are covered in round oil glands (Moolla & Viljoen, 2008). Flowers are produced from spring to early summer and seeds mature towards the middle of summer (Blommeart, 1972). Buchu is a resprouter and can thus be sustainably harvested by only removing the plant's leaves and branches. A harvesting cycle of three years is necessary for plants to fully regenerate and to ensure sustainability (de Ponte Machado, 2003). Buchu's pungent smell is a distinguishing characteristic of the plant.

The two commercial species are best distinguished by leaf shape. *A. betulina*, also known as round-leaf buchu, is a multi-stemmed shrub with broad, 20 mm long, pale green leaves (Figure 2). The plant grows to a height of 2 metres (Moolla & Viljoen, 2008). The dark green leaves of *A. crenulata* are twice as long as they are broad, hence, it is also known as oval-leaf (Moolla & Viljoen, 2008). Both species carry relatively large star-shaped flowers that are white in colour while the flowers of *A. betulina* can sometimes appear light pink (Moolla & Viljoen, 2008). The single-stemmed plant is more tree-like, growing to a height of 2.5 metres.



Figure 2: A. betulina

2.2.2 Buchu distribution

Buchu is endemic to the western interior of the Western Cape of South Africa (Figure 3). The plant grows in a Mediterranean type climate with dry summers and winter rainfall of between 400 mm and 700 mm (Blommeart, 1972). The distribution of *A. betulina* expands from the Cederberg Mountains, situated east of the towns of Citrusdal and Clanwilliam, to the Groot Winterhoek Mountains including the Piketberg Mountain (Goldblatt & Manning, 2000). *A. betulina* is particularly well-adapted to dry conditions and can be found in fynbos habitats on rocky sandstone slopes between 1 500 and 4 000 feet elevations (Gentry, 1961; Moolla & Viljoen 2008;). *A. crenulata* occurs from the Paarl area to the Kleinrivier Mountains in the Overberg to the east of the Province, on lower slopes and valleys on more moist sites (Goldblatt & Manning, 2000).



Figure 3: Species distribution of A. betulina and A. crenulata

2.2.3 Buchu use and medicinal properties

Numerous ethnographic accounts exist of buchu-use by the San, the earliest inhabitants of Southern Africa and the Khoi, who emerged from the San (see Low, 2007). The indigenous San (hunter-gatherers) and Khoi (herders) people are thus believed to be the original users of the buchu plant and have been identified as the traditional knowledge holders of buchu's medicinal properties. The San and Khoi used powdered buchu and infusions alongside other herbs for a number of ailments (van Wyk, 2008). It is understood that the word *buchu* was a generic name given to strong-smelling herbal plants that were powdered (van Wyk, 2008). Powdered buchu was applied on the head to ease headaches or was mixed with sheep fat and smeared on the body to protect against the sun and disease (Low, 2007). Furthermore, buchu leaves were topically applied to wounds and contusions (Low, 2007). Alongside its medicinal uses, buchu was also an important element in hunting rituals and certain rites of passages (Low, 2007). Low (2007) argues that the San and Khoi believed that the power of buchu

resided in its strong aromatic properties that promoted general well-being through a type of cleansing process.

Since its original uses the knowledge of buchu has been adopted and reconstructed by European settlers to whom it was introduced upon their arrival in the Cape in the late 17th century. The use of the plant spread to Europe and America where it was extensively used as a panacea health remedy in the form of tinctures and teas (Low, 2007). Concurrently, buchu developed into an important Afrikaner folk remedy. Afrikaners used it as a tincture in brandy ("boegoe-brandewyn") as a digestive, diuretic, for rheumatism, bladder and kidney function and for coughs and colds while leaves were soaked in vinegar ("boegoe-asyn") for use on fractures, sprains and wounds (Gentry, 1961; Low, 2007; Van Wyk, 2008).

Today, buchu is mostly characterised as a mild diuretic and urinary tract antiseptic (Moolla & Viljoen, 2008). It enjoys a reputation as a general health tonic and is widely promoted to contain anti-inflammatory, anti-oxidant, anti-fungal and anti-bacterial properties. Buchu is processed into health drinks, teas, capsules and lotions for the treatment of rheumatism, arthritis, gout, cystitis, prostatitis, hypertension, wounds and bruises. Such claims, however, have not been widely investigated and mostly appear on internet sites that have yet to be substantiated by peer review. Some *in vitro* studies on buchu's pharmacological properties have reported low to moderate antimicrobial activity for the essential oil of both species against the pathogens tested (Lis-Balchin et al., 2001; Viljoen et al., 2006; Moolla et al., 2007). While the *Agathosma* genus is rich in flavonoids, which have been proven widely to exhibit anti-oxidant activity for *A. betulina* and *A. crenulata*. Some evidence of anti-inflammatory properties of buchu essential oil have been reported by both *in vitro* and clinical studies (Lambert et al., 2002; Viljoen et al., 2006).

Apart from its known medicinal properties, buchu is mainly valued for its essential oil which finds application as a flavour and fragrant in the food and cosmetic industries. Specific properties and said applications are discussed in more detail in Chapter 5 within the context of the local buchu industry. This chapter provided the necessary background to the study by reviewing the global context in which buchu is set and by introducing buchu as a valuable natural resource. The next chapter will outline the methodology employed in the study.

3.1 RESEARCH METHODOLOGY

The research approach of the study was primarily qualitative. The main methods employed were a desktop study of the relevant literature and fieldwork consisting of semi-structured and key informant interviews.

Sampling

Research commenced in January 2015 with the identification of prominent actors in the buchu industry. A purposive sampling approach aimed at maximum variation was employed. Thus participants were intentionally selected according to the objectives of the study alongside the aim of gaining an information rich dataset from a diverse range of perspectives. The strength of this type of sampling is that common patterns that emerge derive significance from having cut across heterogeneous data sources (Patton, 1990). The main groups identified were (1) rural communities involved in the buchu trade either as (a) small-scale buchu farmers or (b) buchu harvesters; (2) large-scale buchu farmers; (3) members of industry, including processors, traders and exporters; and (4) government and nature conservation authorities.

A total of thirty-one interviews was conducted. Although the sample size was pre-determined due to the limited time available to complete the research, the concept of theoretical saturation was taken into account. It was apparent that a point of "saturation" was reached at the tail-end of the data collection process when on-going interviews failed to contribute novel and/or significant information to the developing analysis (Patton, 1990). The decision that further data gathering would be redundant was facilitated by the constant comparison of data throughout the collection process.

Informal introductions to communities were arranged with the help of community representatives. Community representatives introduced the researcher to initial participants willing to partake in the study whereafter subsequent buchu harvesters and small-scale farmers were identified through a snowball sampling approach with participants referring the researcher to community members who could potentially contribute to the study. Snowball sampling was also used to identify commercial farmers. This type of approach was employed because setting up interviews with farmers and harvesters far in advance was practically

challenging due to geographically widespread farms and because contact details of community members were not readily accessible. Industry representatives were identified through internet searches during the desktop study and appointments were made telephonically or via e-mail.

Literature review

A preliminary, desktop study reviewed the literature on biodiversity commercialisation, the cultivation of commercial plant species and the use and trade of buchu. The literature review was expanded to include both published and unpublished documents. Secondary resources including laws, policy documents, permit systems, trade statistics and archival information.

Fieldwork: Semi-structured and key informant interviews

Fieldwork was conducted over a four week period from mid-February to mid-March 2015. A set of interview questions steered towards reaching research objectives was prepared for each of the groups identified. An interview is an effective research tool to assess people's perceptions and can be adapted to fit specific research situations (Punch, 2013). The semi-structured nature of the interviews allowed for the use of impromptu questions to guide discussions towards meaningful interactions. Multiple visits to the study area also provided the opportunity to become better familiarised with the environment and context in which the study was set.

A total of thirty-one interviews were conducted. Interviews with each respondent took between 30 minutes to an hour. Thirty interviews were done on a one-on-one basis either in Afrikaans or English without the help of an interpreter, recorded and later transcribed. One interview was conducted per telephone and notes were taken. Field notes from observations and follow-up notes taken after the interview were also transcribed.

The interviews conducted with each identified stakeholder group are summarised in Table 1. Three rural communities located in the Cederberg region who are involved in the buchu trade were visited: Algeria, Elandskloof and Heuningvlei. Six semi-structured interviews were conducted with buchu harvesters from Algeria. At Elandskloof, six interviews were conducted with harvesters and one with a buchu farmer. At Heuningvlei, two buchu farmers were interviewed. Two employees of a community-based buchu cultivation company situated at Genadenberg, a Moravian Church outpost located on the Piketberg Mountain, were also interviewed. Interviews conducted with community members sought to document their

involvement in the buchu trade, to identify the levels of livelihood dependence on buchu and to gauge their general attitude towards buchu cultivation and the buchu industry as a whole.

Five commercial farmers involved with the large-scale cultivation of buchu were also interviewed. Farmers were questioned about the cultivation process, their perspectives on, and experiences with the buchu trade as well as future predictions related to the industry.

The perspective of the industry was obtained through seven interviews with local processers, traders and exporters. Interviews with industry members allowed for the identification of the main role-players in the production chain of plant-to-product and to gain insights into the market environment.

Finally, two key informant interviews were conducted with a representative from Cape Nature and a representative from the National Department of Environmental Affairs (DEA). Questions aimed at Cape Nature were tailored to gain an understanding of the regulatory environment and accompanying conservation challenges. A representative of the DEA was asked questions on the implementation issues around national biodiversity-use legislation and associated policies and specific management challenges related to buchu.

Actors	Number of respondents
Buchu harvesters	12
Algeria	6
Elandskloof	6
Small-scale buchu farmers	5
Elandskloof	1
Heuningvlei	2
Genadenberg	2
Large-scale buchu farmers	5
Industry members	7
Key informants	2
Total	31

Table 1: Summary of interviews conducted

Data analysis

Interview and field note transcriptions served as primary data. Coding was used to label interview data whereafter themes were pulled together and patterns identified. Emerging substantive and theoretical ideas were recorded throughout data exploration - a process referred to as "memoing"- from which propositions were developed (Punch, 2013). Memoing aids the researcher in progressing from raw data towards concepts that explain the research phenomena in the context in which it is being studied (Birks et al., 2008; Punch, 2013).

Information obtained from interviews was used to compile a timeline of events for the buchu trade from which trends, patterns and developments could be extrapolated. This was expanded and substantiated through reference to secondary data sources.

Ethical considerations

All ethical considerations as outlined in the University of Cape Town Code for Research involving Human Subjects were taken into account during the study. In particular, all respondents were asked to sign a prior-informed consent form, containing all necessary information to facilitate their giving of full informed consent to participate in the study. Participants were presented with information on the nature and purpose of the research, including their specific role in the outcome of the study. Respondents' anonymity were assured unless permission to use names or positions was expressed. Permission was also obtained from participants before recordings of conversations were made or photographs taken. The appropriate channels to facilitate introductions to relevant community members were followed. Bearing in mind that participants had no obligation to assist in the proposed study, the project aimed to uphold the highest level of participants' trust, confidence and insights.

3.2 STUDY AREA

The study area extends across the western interior of the Western Cape, in correspondence with buchu's natural distribution and the processing industry that has developed in the area. The total study area ranges from the towns of Paarl in the south, to Clanwilliam in the north. Most of the fieldwork was conducted in the mountainous Cederberg area – where wild buchu is most prevalent – which is located east of the towns of Citrusdal and Clanwilliam in the Oliphants River Valley (Figure 4).



Figure 4: Map of study area

The region forms part of the Cape Floral Region (CFR) which is an internationally acclaimed biodiversity hotspot, defined as an area featuring high concentrations of endemic species that is experiencing rapid loss of habitat (Myers et al., 2000; Goldblatt & Manning, 2002). The area extends across the Succulent Karoo and Fynbos biomes. The main vegetation type of the region is mountain fynbos (Mucina & Rutherford, 2006). Most of the approximate 100 km

stretch of the Cederberg mountain range is a designated protected area– the Cederberg Wilderness Area (CWA) – totaling an area of 65 000 ha (CapeNature, 2012).

The communities of Algeria, Elandskloof and Heuningvlei are situated within the Cederberg Local Municipality (CLM) which forms parts of the West Coast District (WCD) of the Western Cape Province. The Western Cape Province has an estimated population of 5.8 million people and the lowest unemployment rate in the country, namely 21.6 % (STATS SA, 2011). The Province experienced a decline in its poverty rate from 26.7 % in 2001 to 22.1 % in 2010 (MERO, 2014). Despite these advances at provincial level, the WCD has been the slowest growing district in the Western Cape Province and diminishing agricultural activity has put additional strain on the district's growth and employment creation, leading to increased socio-economic pressures (MERO, 2014). While the unemployment rate for the district is relatively low at 14.6 %, it is the only district in the Province to experience an increase in unemployment numbers between 2001 and 2011 (MERO, 2014). The district experienced zero per capita income growth between 2001 and 2011 and the region has suffered increasing levels of poverty requiring support from the government in the form of free basic services (MERO, 2014). The literacy rate (the proportion of persons aged 15 years and older with an education qualification of higher than Grade 7) in the WCD is relatively low at 79.1 % when compared to the Province which stands at 87.2 % (MERO, 2014).

The Cederberg Local Municipality covers a total area of 8 007 km² and has a total population of 49 768 people (Stats SA, 2011). The major towns of the municipality are Clanwilliam and Citrusdal. The majority of the population identifies as Coloured (75.7 %) and Afrikaans is the dominant language in the area (85.4 %) (Stats SA, 2011). The literacy rate of the CLM is 73.2 % which is the lowest in the district (MERO, 2014). The CLM is characterised by largely unequal distribution of income among the income categories. The municipality has the second lowest unemployment rate in the district of 10.5 % but the highest poverty rate at 42.7 % - which has steadily increased from 2001-2011 (MERO, 2014). This discrepancy can be explained by the municipality's relatively large numbers of unskilled and semi-skilled labour required by the CLM's strong primary and secondary sectors (MERO, 2014). The GDP per capita in the CLM is the lowest in the district at R19 474 per annum with the second lowest economic growth rate at 2.2 % in the district (MERO, 2014).

Algeria

The settlement of Algeria, also known as Bosdorp, borders the CWA 45 km from the town of Citrusdal, some 200 km north west of Cape Town. Algeria was established by the Department of Forestry in the 1960s to serve as housing for staff employees and their families and has since been used by park officials after the establishment of the CWA in 1973 (Wilson, 2015). The land has been managed in terms of a Community Property Association since 2004 after the land (442 Ha) was legally allocated to the resident community (Wilson, 2015). The community of 40 households is well-organised under the strong leadership of a governing committee and has access to basic services and public amenities. The community harvest wild buchu and rooibos that grows on community mountain land, 340 Ha in extent, which is managed under a stewardship agreement with CapeNature (Wilson, 2015). A large number of community members are employed by CapeNature, either permanently or on a contractual, semi-permanent basis (Wilson, 2015). Others find temporary employment with the local municipality or do seasonal labour on neighbouring farms. Some community members farm with fruits and vegetables which serve as a source of income as well as for subsistence use.

Elandskloof

Elandskloof comprises two farms of some 3 100 ha in the Cederberg Mountains situated 17 km south east of the nearest town of Citrusdal. The community of 85 households is descendants of the indigenous Khoi people and former slaves who joined the then Dutch Reformed Church Mission station in the late 19th century (Anderson, 1993). Elandskloof is known for being the first resolved restitution case in post-apartheid South Africa after the land was returned to the community in 1996, thirty-four years after their forced removal (Barry, 2011). The resettlement process has been fraught with administrative challenges and there has been little development on the farm since it was handed back to the community (Williams, 2005; Barry, 2011). Commercial farming operations on the farm, primarily fruit orchards, have ceased, infrastructure and housing is poor and unemployment is rife (Respondent 23, pers. comm., 2015). Furthermore, poor management of the farm has been exacerbated by a history of internal conflict and family rivalry (Barry, 2011). Since 2005, Elandskloof has been under the administration of the Director-General of Land Affairs after ongoing disputes led to the dissolution of the governing committee (Respondent 23, pers. comm. 2015). The majority of the residents work as seasonal labourers on surrounding farms

and citrus factories, and some keep small livestock (Williams, 2005). Wild buchu and wild flowers are harvested on a communal basis on community owned land.

Heuningvlei

Heuningvlei is a Moravian Church mission village situated on the eastern boundary of the CWA. Located approximately 75 km east of Clanwilliam, the small community of 22 households is only accessible by gravel road over the Pakhuis Pass. Heuningvlei is one of six outposts of the Wupperthal mission station that was established by German Rhenish missionaries in the 1830s. The population comprises mixed-race descendants of Germansettlers, former slaves and the Khoi people (Nell, 2005). Community members lease residential and agricultural land from the Church to which they have a lifetime right (Wilson, 2015). The residents are subsistence farmers, farming with sheep, vegetables and rooibos. Other important income sources include community tourism initiatives and state grants (Wilson, 2015). A buchu cultivation and distillation project was initiated at Heuningvlei in 2006 by the Department of Agriculture and private sector interests.

3.3 LIMITATIONS TO THE STUDY

Certain study limitations are recognised. First, the scope of the study was constrained by the limited timeframe of six months allocated to complete the data collection, data review and final presentation. The size of the study area and remoteness of communities further limited the scope of the study. The availability of more time to conduct lengthier interviews with a larger number of people within each stakeholder group may have resulted in a richer dataset. However, as already mentioned, it was concluded that the total data collected satisfied the research objectives of the study. It is therefore acknowledged that the study represents an overview of the buchu industry and the main issues surrounding cultivation as opposed to an in-depth investigation of the buchu trade.

The biggest limitation of the study was the general lack of transparency by industry members. Interviewees were often unwilling to share trade information about volumes, prices and clients due to concerns about compromising their position in the market. Furthermore, some interviewees were reluctant to answer questions on issues surrounding indigenous knowledge and access and benefit sharing. The sensitive nature of such questions may have resulted in subdued or more superficial responses. Lastly, the refusal by a major local company, Puris, to partake in the study meant the possible loss of valuable insights into the industry. Puris

declined to take part as they believed any sharing of information could negatively impact on business operations.

4.1 INTRODUCTION

This chapter will address the first four objectives of the study which are 1) to explore the contemporary history of the dynamics between buchu harvesting and buchu cultivation 2) to identify the different actors involved in the buchu trade 3) to report on the present policy and market contexts and 4) to gain an understanding of the extent to which buchu is being cultivated in the Western Cape. First, buchu's evolution is traced from its beginnings as a famed herbal remedy to a niche-product in specialised international flavour and fragrant markets. Second, the policy and legislative environment of buchu is reported on. Thereafter, the present main actors of the local buchu industry are identified and the market environment in which they interact explored. These actors include (1) rural communities that fulfil a role as primary producers of the trade either as (a) buchu harvesters or (b) small-scale buchu farmers; (2) large-scale buchu farmers; and (3) prominent members of industry. The third objective regarding buchu cultivation in the Western Cape is addressed in section 4.4.1, below the headings *small-scale buchu farmers* and *large-scale buchu farmers*.

4.2 CONTEMPORARY HISTORY OF THE BUCHU TRADE

Buchu has a millennia old history of use in South Africa and a track record of export to European countries that extends across two centuries (Figure 5). It is believed that buchu was first introduced to the Dutch settlers by the indigenous Khoi people upon their arrival at the Cape of Good Hope in the latter half of the 17th century (Low, 2007). While the use of buchu as a medicine became custom among Cape settlers and Africans alike, it was only in 1821 that buchu formally entered the international medical market. Buchu leaves and information on its acclaimed medicinal value were sent to England from the Cape where the findings of confirmed trials were published in the medical guide *The Gazette of Health* (Reece, 1821). Afterwards, affirmations of buchu as a powerful diuretic, digestive, anti-septic, remedy for rheumatism and general health tonic spread across the medical community (Low, 2007).

By 1850 buchu was popularised by druggists on the East Coast of America. This was done most actively by the chemist Dr. H.T. Helmbold's and his "*Fluid Extract of Buchu*" which was extensively advertised across North America, Europe and Asia (Young, 1961). Buchu was recognized by the American and British Pharmacopeias as well as in various

pharmaceutical publications and continued its prominence in global medical markets across the nineteenth century and into the twentieth century (Low, 2007). Buchu leaves were harvested, dried and baled in South Africa and exported to Europe and America where they were processed into tinctures, teas and ointments. Bales of buchu were famously aboard the Titanic on its first and final voyage in 1912 (Encyclopedia Titanica, 2003).

Around 1900, buchu was found to produce an essential oil with beneficial flavour and fragrance properties upon distillation (Esterhuysen, undated). With increasing global demand, local interest in buchu grew. During the time of the First World War, Kirstenbosch National Botanical Gardens conducted studies on the feasibility of cultivating the plant and distributed surplus seeds to interested farmers (Low, 2007). According to a buchu farmer and distiller situated in Piketberg (Respondent 1, pers. comm., 2015) buchu was first successfully cultivated on a large-scale in Mouton's Valley (Piketberg) by the Versveldt family in 1902. Gentry (1961) recorded that the cultivation of buchu started around 1927 in the Clanwilliam region.

By the 1960s, buchu was increasingly being cultivated in the Cederberg and Paarl area, mostly by farmers who also harvested wild buchu growing on uncultivated corners of their land for export. At this stage cultivation was on dryland and remained experimental and unsophisticated with some farmers simply actively dispersing seeds near naturally growing populations to increase annual yields (Respondent 2, pers. comm., 2015). Other farmers elected to plant the easier to cultivate of the two commercial species, *A. crenulata*, in *A. betulina* areas which led to the unwanted hybridisation of the two species (Coetzee, 2004). Increased efforts to cultivate buchu were brought upon by the increased demand for buchu's essential oil which had wide application in Post-World War II Europe (Esterhuysen, undated). After export, buchu oil would be extracted from leaves using vacuum or steam distillation whereafter it would be used in the European flavour and fragrant industries. Locally, extraction through steam distillation was pioneered by Edward Godfrey from Waterfall Health Farm situated in Paarl in 1969 (Respondent 3, pers. comm., 2015).

In the early 1970s buchu production reached a peak as buchu oil established itself as one of the most expensive and sought-after essential oils in the world (van Tonder, 1976). However, the synthesis of nature identical chemical compounds for the flavour market in the 1970s caused a decrease in the demand for the more costly to import buchu oil and a subsequent
drop in exports (Esterhuysen, undated; van Tonder, 1976). A third generation buchu farmer from Piketberg (Respondent 4, pers. comm., 2015) recalls that during the market "crash" of the mid-1970s farmers neglected their cultivated crops while surplus harvested buchu was simply "tossed into the streets" for free collection by interested parties. A decade later, an expanding consumer interest in "natural" products and ingredients once again opened up the



Figure 5: Timeline of buchu commercialisation

European market for buchu oil, whereafter, the price of buchu steadily increased throughout the 1990s. Increasing attempts to cultivate the plant in the 1990s were in response to the concern by various stakeholders about the sustainability of the plant in the wild. Prompted by market demand, it was believed that the overharvesting of buchu put the wild resource at a serious risk (de Ponte Machado, 2003; Coetzee, 2004). In 1999, in response to increased exploitation of the plant, the Agricultural Research Council (ARC) initiated a project aimed at achieving the commercial cultivation of buchu. The ARC is the principal agricultural research institution in South Africa with the core mandate to conduct research and drive technology development in order to promote and develop the agricultural sector and related industries as well as to facilitate natural resource conservation and alleviate poverty (ARC, 2014). Fears that importer countries would start cultivating buchu or producing synthetic substitutes further prompted action to ensure supply and secure economic benefits (Coetzee, 2004). Existing producers were encouraged by the ARC to share their knowledge of effective cultivation methods and best-known farming practices. In partnership with private companies, the ARC created gene banks of good quality buchu, and seeds, seedlings and rooted cuttings were supplied to farmers interested in establishing plantations. A number of community buchu cultivation and distillation projects were also initiated with help from government, conservation authorities, industry partners and foreign donors (Coetzee, 2004; Brown et al., 2009). Around this time, conservation concerns also prompted the formation of a buchu forum which served as a platform for information sharing.

Efforts to domesticate the plant increased exponentially as establishing buchu plantations and selling seedlings or seeds was a remarkably profitable venture. Within two years of planting, buchu could produce a 100 % return on capital investments and make an estimated R150 000 to R200 000 profit per hectare in each subsequent year (Respondent 5, pers. comm., 2015). Buchu farmers expanded their plantations and sold buchu seedlings or buchu seeds to more than willing buyers looking to plant their own crops in order to profit from the lucrative trade. Furthermore, companies in the essential oil or natural extract industry and some buchu farmers extended their practices into buchu oil extraction. This growth period from the late-1990s to the mid-2000s was characterised by fierce competition and clandestine operations during which a number of fly-by-night operations surfaced, some relentlessly undercutting competitors in a bid to gain buyers.

During this time, high prices also resulted in mass poaching of buchu on privately owned land as well as within protected areas such as the Cederberg Wilderness Area (CWA) (CapeNature, pers. comm., 2015). Moreover, poachers often employed incorrect harvesting techniques resulting in the complete destruction of the plants. Poaching reached such extremes that farmers would have to guard their buchu at night while armed to deter thieves (Respondent 4, pers. comm., 2015). One respondent from a local processing company recalls:

"It was a free-for-all. It was a nightmare. People were running through mountains in the night, stealing buchu and hauling it down the mountains on these big slings" (Respondent 6, pers. comm., 2015).

By the mid-2000s buchu production and the subsequent supply of buchu oil to overseas markets reached an all-time high. Partly assisted by the weakening Rand, the price peaked at R40-R68 per kilogram wet material and R5 000-R8 000 per kilogram buchu oil (Respondents 3, 4, 5, 7, 8 pers. comm., 2015). The turning point was reached during the global financial crisis of 2007/2008, when nature identical compounds once again became the more economically viable ingredient to produce. An oversupply of buchu and competitive pricing at the time when demand was decreasing resulted in the devastating crash of the buchu market in 2008 (Respondents 3, 4, 5, 7, 8 pers. comm., 2015). Some industry respondents (Respondents 4, 9, 22, pers. comm. 2015) believe that the crash can be partly ascribed to the annual International Federation of Essentials Oils and Aroma Trades (IFEAT) conference which was hosted in Cape Town in 2006, where international buyers experienced first-hand the amount of buchu available in the country and as a result gained a major bargaining advantage. Prices plummeted to as low as R3,50 per kilogram wet material and R400 per kilogram oil (an estimated 90 % drop in price). One industry respondent recalls:

"It was frightening, it really was. There were stages where we were like okay, maybe we should just close the doors ourselves and not go any deeper. It really was bad...I mean there were people that came in that could not survive and the only reason why we survived is because we were competitively durable and we've been established for 45 years." (Respondent 3, pers. comm., 2015)

Following the decline in value, several farmers started to neglect their cultivated buchu crops, some doing away with them completely, and oil producers exited the trade after large

investments failed to produce expected returns. In 2015, almost a decade later, the local buchu industry has still not fully recovered.

4.3 POLICY AND LEGISLATIVE ENVIRONMENT

The management of buchu as an indigenous biological resource is governed by international agreements, national legislation and national policies. Key legislation is summarised in Table 2. These legal documents pertain to the conservation of biodiversity as well as the sustainable exploitation of bio resources and traditional knowledge. Those most pertinent to the study are briefly discussed in this section.

Name	Date	Description
International Agreements		
Convention on Biological Diversity (CBD)	1992	 International treaty of Rio Earth Summit (1992) Three main objectives: 1. The conservation of biodiversity 2. The sustainable use of biodiversity 3. Fair and equitable share of benefits arising from the use of genetic resources
Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilisation.	2010	Provides the legal framework for the implementation of the third objective of the CBD pertaining to access and benefit sharing
National Legislation		
National Environmental Management Act (107 of 1998) (NEMA)	1998	The overarching environmental framework of South Africa that gives legal effect to the environmental rights set out in Section (24) of the Constitution
The National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA)	2004	The national legislation that provides for the management and conservation of the country's biodiversity within the framework of NEMA
NEMBA Regulations on Bioprospecting, Access and Benefit-Sharing (No. R 138 of 2008)	2015	Regulations for the use of indigenous biological resources and associated traditional knowledge and the fair and equitable share of derived benefits.
Protection, Promotion, Development and Management of	-	To provide for the development and management of indigenous knowledge systems including

Table 2: Key legislation and policies pertaining to the management of buchu

Indigenous Knowledge Systems Bill (First Draft) (2014)		providing conditions of access to indigenous knowledge in order to protect the rights of indigenous knowledge holders.
Conservation of Agricultural Resources Act (43 of 1983) (CARA)	1984	Provides for control over the utilization of natural agricultural resources in order to promote the conservation of the soil, water sources, vegetation and the combating of weeds and invader plants and accompanying matters.
National Policies		
National Biodiversity Strategy and Action Plan (NBSAP)	2005	A set of strategic objectives for the conservation and management of biodiversity to ensure the sustainable and equitable share of derived benefits (in line with South Africa's commitments under the CBD).
Indigenous Knowledge Systems Policy	2004	Framework that outlines means to safeguard indigenous knowledge and to strengthen the contribution of indigenous knowledge to social and economic development in South Africa.
Provincial Regulation		
Nature and Environmental	1975	Provides for the conservation and management of
Ordinance of 1974		fauna and flora in the Western Cape.
(Ord. 19, 1974)		

As a party to the Convention on Biological Diversity (CBD) and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilisation, South Africa is required to adhere to certain obligations and provisions. The country' commitments to the CBD are addressed by the National Biodiversity Strategy and Action Plan (NBSAP) and implemented by the National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA).

Regulations on "bioprospecting"- the exploration of biodiversity for commercially valuable genetic resources and biochemicals (Reid et al., 1993) - are provided for by Chapter 7 of NEMBA and further outlined by NEMBA's Regulations on Bioprospecting, Access and Benefit-Sharing (BABS). The BABS regulations set out procedures to be followed by those utilising indigenous biological resources and associated traditional knowledge for commercial or industrial purposes to ensure the fair and equitable share of benefits derived from such activities. Access to indigenous knowledge is intended to be concurrently managed by the Protection, Promotion, Development and Management of Indigenous Knowledge Systems Bill (2014) which was gazetted for comment during the time of the study. The

specific legal tools provided by these laws are prior informed consent, permitting arrangements and benefit-sharing agreements.

Amendments to the BABS Regulations were gazetted during the study period in May 2015 following the adoption of the Nagoya Protocol and concerns raised by various stakeholders regarding weak and poorly defined legislative provisions of the 2008 regulations. The main amendments include the differentiation between "biotrade" and "bioprospecting," the addition of types of permits for specified commercial activities and procedural changes to the permitting system.

NEMBA defines bioprospecting as:

"...any research on, or development or application of, indigenous biological resources for commercial or industrial exploitation, and includes-

- (a) the systematic search, collection or gathering of such resources or making extractions from such resources for purposes of such research, development or application;
- (b) the utilisation for purposes of such research or development of any information regarding any traditional uses of indigenous biological resources by indigenous communities; or
- (c) research on, or the application, development or modification of, any such traditional uses, for commercial or industrial exploitation"

Biotrade is referred to as:

"...buying and selling of milled, powdered, dried, sliced or extract of indigenous genetic and biological resources for further commercial exploitation."

In the light of the above definitions, the processing of buchu can be both a bioprospecting and biotrade activity. Five different permits related to the phase of the commercial activity (discovery phase or commercialisation phase) and the type of commercial activity (biotrade, bioprospecting or research) can be issued. Prior informed consent and a material transfer agreement must be obtained from relevant stakeholders before a permit can be issued. Stakeholders include those who give access to the biological resource (e.g. landowners) and indigenous communities whose traditional use or knowledge of the resource is used during the commercialisation process.

A signed benefit-sharing agreement outlining how non-monetary and monetary benefits derived from biotrade or bioprospecting will be shared among stakeholders must accompany a permit application. Benefit-sharing agreements provide legal access to genetic and biological resources or to the associated traditional knowledge. Benefits include activities that promote the conservation, sustainable-use and development of the genetic and biological resource, research support and the improvement of community livelihood and technical capacity. Any monetary benefits to stakeholders are to be transferred into the Bioprospecting Trust Fund which is administered by the National Department of Environmental Affairs (DEA), in accordance with the benefit-sharing agreement.

The cultivation of buchu also needs to comply with any prescribed agricultural control measures under the Conservation of Agricultural Research Act (43 of 1983) (CARA) and the associated Regulations. Of particular importance are regulations pertaining to the cultivation of new land which has not been disturbed previously i.e. undeveloped or natural land, which is simultaneously regulated under the National Environmental Management Act (107 of 1998) (NEMA). In accordance with CARA, permission must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) before virgin soil is cultivated while an Environmental Impact Assessment is required should cultivation involve more than 100 ha of land, as stipulated by NEMA.

Also pertaining to cultivation, as a protected species under the Nature and Environmental Ordinance of 1974 (Ord. 19, 1974), anyone that grows or sells buchu needs to register as a buchu grower or seller with the Provincial nature conservation authority, CapeNature. A separate permit is required to harvest buchu, both wild and cultivated, and a permit is issued to allow for the export of the plant.

4.4 MARKET ENVIRONMENT

4.4.1 Main actors

The main actors of the local buchu industry are, (1) rural communities involved in the buchu trade either as, a) buchu harvesters, further specified into community members who, i) harvest communally-owned wild buchu and, (ii) harvest cultivated buchu on large-scale buchu farms, or, b) small-scale buchu farmers; (2) large-scale buchu farmers; and (3) members of industry, which includes, traders, processors and exporters.

(1) Rural communities

Buchu harvesters

Two rural communities in the Cederberg are involved in the harvesting of wild buchu which is purchased by local processing companies: Algeria and Elandskloof. The harvesting and use of buchu has formed an important part of the livelihoods and culture of both of these communities for decades. Prior to the establishment of the Cederberg Wilderness Area (CWA), the Algeria community harvested tons of buchu all over the Cederberg Mountain which would be dried, baled and sold to the then Forestry Department (Respondent 13, pers. comm., 2015). Similarly, before their eviction, Elandsklowers would spend days in the mountains to harvest and dry mass volumes of buchu whereafter income from sales would be managed by the church in a manner that would collectively benefit the community (Williams, 2005).

Both harvesting communities also have an age-old belief in the medicinal value of buchu. In the past, Algeria residents used buchu in combination with other herbal plants to treat a variety of medical afflictions, especially since doctors were too far to visit regularly and donkey carts were the only mode of transport (Respondent 14, pers. comm., 2015). Today, buchu is still used in a number of households of both communities, as a treatment for colds and flu, fever, back pain and to improve kidney function. The plant is generally thought of as a cure-all herbal remedy with the power to restore health and relieve pain. When asked about its uses, respondents would reply that it helps with "everything" and "anything" or simply that "it makes you healthy." Buchu leaves, either dried or not, are boiled in water to make an infusion which is ingested after cooling.

The residents of Algeria harvest buchu that grows on community mountain land (340 ha) every two years. Buchu harvesting is managed by the community's governing committee of which one committee member is responsible for the organisation of the harvesting permit and for securing a possible buyer. The total amount of buchu available to harvest at Algeria is less than two tons. Buchu is harvested in the summer months, preferably January to March. On average a harvester will cut 80-100 kg of buchu a day and harvesting will last a maximum of two to three days, depending on the number of harvesters that decide to participate. The decision to harvest is determined by the financial need of the household at the time of the harvest. Although the choice to harvest is open to the entire community, harvesters are mostly

unemployed males or males that work as seasonal labourers. Algeria's buchu was last harvested in 2013 (a total of 1.2 tons) and purchased for R7 per kilogram by a distillery based in Citrusdal, generating a total of R8 400. Customarily, a small percentage of the money earned from buchu is deposited into the community fund which is primarily used for administration costs or general community upkeep. At the time of the study, the community was awaiting a permit and had an interested buyer willing to pay R9 a kilogram for a total of 1.5 tons. The committee liaison officer predicted that between ten and fifteen people, mostly unemployed, would take part in the harvesting (Respondent 15, pers. comm., 2015). This equates to 100-150 kg buchu per harvester which will earn each harvester between a total of R600-R900, after R3 per kilogram goes towards the community fund (Respondent 15, pers. comm., 2015).

At Elandskloof, buchu that grows on communally owned mountain land (2 420 ha) is customarily harvested every two years. Harvesting years, however, may vary depending on need or demand. While approximately 15 tons of buchu is available for harvest, the total seasonal harvest depends on the amount specified by an interested buyer who has varied over the years. Presently, harvesting is managed by the government administrator in consultation with the community seniors. Although anyone in the community can decide to harvest, harvesters are mostly males that work as seasonal labourers on farms in the region. The community's buchu was last harvested in 2014. A total of 6 tons was purchased by a distillery situated in Citrusdal for R8 a kilogram generating a total of R48 000. Unlike Algeria, harvesters are paid the full amount as there is no community fund operational at present. The amount harvested varies across harvesters and is dependent on personal determination. On average, a harvester will cut 20-50 kg of buchu a day but some may cut up to 90 kg. Harvesting lasts about a week, depending on the number of harvesters that decide to partake and the volume requested by the buyer. The amount earned varies greatly amongst harvesters and from season to season. An individual harvester can earn between R500-R3 000 a harvesting season.

Some Elandskloof community members are also hired as day labourers by processing companies or large-scale buchu farms to cut, distill and sort dry buchu during the harvesting season. At the time of the study, a small group of community members were being paid R3 a kilogram buchu to cut on buchu farms for a local processing company. Labourers cut an approximate 80 kg per day (for about 3 days) earning them R240 a day which is double the

minimum daily wage for farm workers in the country (South African Department of Labour, 2015). A summary of findings for the two communities is presented in the Table 3.

	Algeria	Elandskloof
Volumes of buchu available	± 2 tons	± 15 tons
Volumes of buchu traded	1.5 tons (2015)	6 tons (2014)
Price harvesters receive per kilogram	R6 (2015)	R8 (2014)
Income a harvester receives per season from buchu	R600-R900	R500-R3 000
Percentage contribution to annual income	< 20 %	< 20 %
Other sources of income	Permanent or semi-permanent employment at CapeNature or the local municipality, seasonal agricultural labour, home gardening, government grants, Rooibos harvesting	Seasonal agricultural labour, wild flower harvesting, home gardening, livestock farming, government grants
Medicinal uses of buchu mentioned by respondents	Colds, flu, fever, back pain, kidney function	Colds, flu, kidney function, back pain, ear pain
Community organisation	Governing committee	Under government administration

Table	3:	Summary	of findings
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Small-scale buchu farmers

Buchu has traditionally not been farmed by the rural communities of the Cederberg. However, as mentioned, a number of community-based buchu cultivation projects aimed at upliftment and empowerment were initiated by the government in collaboration with research institutions, non-governmental organisations (NGOs) and industry partners during the buchu price peak (Coetzee 2004; Brown et al., 2009; Respondent 7, pers. comm., 2015). Buchu has been cultivated at Algeria, Elandskloof, Heuningvlei and Genadenberg, a Moravian Church outpost in Piketberg, with varying degrees of success. Owing to a myriad of internal as well as external factors cultivation projects have largely failed to reach intended aims.

At Algeria, a buchu nursery was erected in 2005 with funds and technical assistance provided by the Agricultural Research Council (ARC) in partnership with a Paarl-based processing company and CapeNature. The main aim of the project was to provide a more stable income to the community with buchu harvested and sold more frequently. However, after just one harvest, the buchu became susceptible to fungal attacks because of overwatering, resulting in the death of most of the plants (Respondent 15, pers. comm., 2015). When the community was unable to recover the nursery due to financial restraints during the time of the buchu price decline, the project collapsed and the nursery was taken down.

A buchu cultivation project was also implemented in 2004 at Elandskloof by CapeNature, the ARC, a buchu processing company and the Department of Agriculture. The end-goal of the project was to establish 30 ha of buchu over a period of three years and, contingent on the success of cultivation, a distillation facility to produce buchu oil. A total of 10 ha of buchu was planted by eight community members who occupied land on the outskirts of the farm and who had the necessary space to cultivate. A Paarl-based distiller supplied the community with the necessary inputs and the selected community members were offered the required training. To date, only three of the original eight community members still have some viable buchu crops (less than 2 ha) and harvest their buchu together with the community's buchu when a buyer and a harvesting permit is secured. The remaining 20 ha were not planted in subsequent years and the distillation facility never materialised.

At Heuningvlei, 1.5 ha of buchu was planted in 2006 under irrigation with the help of the Department of Agriculture and a private processing company. The buchu is managed by the nine member community agricultural co-operative. Equipment required to steam distil the buchu for the production of buchu oil was also donated by the project initiators. Although the cultivated buchu is still maintained it has never been harvested or, consequently, distilled for its oil, thus generating no financial benefits to the farmers to date.

A similar project has been operating at Genadenberg from 2006. The project, which was initially aimed at women's empowerment, was initiated by a local NGO and the Council for Scientific and Industrial Research (CSIR) in collaboration with industry partners. The CSIR is a premier research body that undertakes multidisciplinary research, technological innovation and industrial and scientific development to improve the quality of life of the country's citizens (CSIR, 2015). The community-based enterprise - Genadenberg Natural Products - is a registered non-profit company under the management of the Moravian church from whom the land is leased (Brown et al., 2009). Nine hectares of cultivated buchu is annually harvested and distilled by a fully equipped distillation facility on site. Three people

are permanently employed to maintain the buchu and manage its distillation while additional labourers (8-10) assist in harvesting the buchu during harvesting season. The last harvest produced 99 L of oil which was sold to a local processing company (Respondent 16, pers. comm., 2015). Taking into account the above three cultivation efforts, the total extent of small-scale buchu cultivation in the Western Cape is less than 12 hectares.

(2) Large-scale buchu farmers

As of 2008, buchu raw material has been primarily obtained from cultivated sources. Virtually no wild harvesting of buchu currently occurs or has done since the crash of the market, apart from the harvesting done by the two rural communities. This is because the harvesting of wild buchu is too costly to carry out at current price levels due to it being labour-intensive and time-consuming. Plants grow high on mountain slopes and between crevices, requiring labourers to cover large distances in search of shrubs while carrying heavily loaded bags. Traditionally, some farmers would use tractors and donkeys to help with the transport of buchu across mountainous terrain (Respondent 10, pers. comm., 2015).

Buchu is cultivated on a commercial scale as a dryland and irrigated crop in selected areas of the Western Cape. Farmers produce buchu as part of the mixed farming strategies they employ with buchu being secondary to other farming operations. The total estimated extent of cultivated buchu in the Western Cape, including the small-scale cultivation discussed above, (irrigated and dryland) is 250-300 ha. This figure is an extrapolation of the number of hectares cultivated by interviewed farmers and the estimates provided by industry respondents (Respondent 1 & 5, pers. comm., 2015). The largest irrigated buchu crops are situated on Witelskloof Farm near Clanwilliam (15 ha), in the Mouton's Valley on the Piketberg Mountain (50 ha) and at Hebron Estate on the Piketberg Mountain (60 ha). These farms solely provide raw material to the processing companies Skimmelberg, Piquet Buchu and Afriplex, respectively (Table 5). The remaining cultivated buchu pockets (less than 25 ha each) are on farms in the Cederberg (between the towns of Citrusdal and Clanwilliam), Paarl/Klein Drakenstein and Piketberg areas. Most of these farms have naturally occurring buchu and have established some buchu crops, typically dryland to increase annual yields. Processors, who do not cultivate buchu themselves, source raw material from these local farmers.

No expansion of cultivation is currently occurring or has occurred over recent years. In contrast, some farmers are presently neglecting their buchu plantations as they are not profitable to maintain (Respondent 3 & 4, pers. comm., 2015). This is a concern to processors who are reliant on a constant supply of good quality raw material (Respondent 3 & 8, pers. com., 2015). Farmers interviewed who have dryland plantations stated that the only reason that they have not removed their buchu crops is because no other crop will grow on the steep slopes and windy conditions under which buchu is able to flourish (Respondent 2, 4, 12, pers comm., 2015). Farmers with dryland and irrigated crops stated that they had no plans to increase hectares any time soon unless demand grows drastically and the price for buchu renders expansion more economically viable (Respondent 2, 4, 7, 11, 12, pers. comm., 2015). Large-scale cultivation and small-scale cultivation is summarized and compares in Table 4.

	Small-scale cultivation	Large-scale cultivation
Actors	Rural communities: Elandskloof, Genadenberg & Heuningvlei	Commercial farmers, Processing companies
Size of cultivated area	1.5 Ha – 9 Ha	10 Ha – 60 Ha
Total Extent	< 12 Ha	250-300 На
Type of water-use	Non-irrigated	Non-irrigated & irrigated

Table 4: A comparison of small-scale buchu cultivation and large-scale buchu cultivation

Propagation through seed germination is the most widely employed method of cultivation by both small-scale and large-scale farmers. Seedlings are either grown under controlled conditions for later transplantation or seeds are directly sown on prepared land. Although the initial technical difficulties of cultivating buchu have been mostly overcome, the cultivating process is still described as difficult (Blommeart, 1972; Xaba & Lucas, 2009; Respondent 1,5, pers. comm., 2015). Special care should especially be taken when seedlings are transplanted as survival is affected by disturbance to the root system, whereafter, optimal conditions are required to ensure growth (Blommeart, 1972, Respondent 5, pers. comm., 2015). The biggest challenge is finding the correct soil to grow buchu (Respondent 2, 5, 7, pers comm., 2015). Buchu requires typical fynbos soils that are coarse-grained, acidic and nutrient poor and that have not been cultivated on before (Gentry, 1961; Ntwana, 2007; Xaba & Lucas 2009).

After establishment, crops require little care and farming input except for the removal of encroaching weeds which is done manually. Buchu plants are susceptible to soil-borne fungus attacks and the Citrus caterpillar but both can be easily managed (Xaba & Lucas, 2009). A buchu plant is mature after four years but can undergo first harvest after 12-18 months (Blommeart, 1972, Respondent 11, pers. comm., 2015). Harvesting is done by hand with the use of a sickle or pruning shears. Crops are harvested yearly and are re-established after 8-10 years. *A betulina* yields 2-3 tons of vegetative material per hectare and *A. crenulata* 4-5 tons per hectare, depending on age and cultivation practice (Respondent 5, pers. comm., 2015).

(3) Members of industry

The major processing companies of the local industry have remained fairly consistent over the last decade. Presently, the industry is dominated by 6 major processing companies: 1) Afriplex; 2) Piquet Buchu; 3) Puris; 4) S Chicken Naturals; 5) Skimmelberg (in partnership with sister company Cape Kingdom Nutraceuticals); and 6) Waterfall Health Farm (Table 5).

Processing companies source raw material directly from rural communities or large-scale buchu farmers and fulfill the roles of processors, local traders and exporters. Three of the six companies, Afriplex, Piquetbuchu and Skimmelberg, are major producers of buchu raw material of which the latter two companies source cultivated buchu exclusively from their own farms. The export of buchu oil constitutes the majority of these companies' buchurelated business. Each of these enterprises has captured their own niche market for their specific product related to species and oil profile, through years of client relations and marketing. Puris is the only local company that specialises in sophisticated fractional distillation processes and formulations to produce value-added flavours and fragrances before export.

Company	Est.	Location	Products	Cultivated hectares	Income from buchu sales
	2001	Paarl	Buchu oil - A. betulina - A. crenulata Buchu powder Buchu tincture Buchu emulsion	60 ha A. betulina	5 %
Piquet Buche	2008	Piketberg	Buchu oil - A. betulina Buchu dry leaf Buchu soap Buchu water	50 ha A. betulina	100 %
PULLS	Unknown	Paarl	Buchu oil - A. betulina - A crenulata Fractions of buchu oil	N/A	Unknown ²
S Chicken Naturals	1941	Citrusdal	Buchu oil - A. betulina Buchu soap Buchu balm Buchu dry leaf	N/A	90 %
skimmelberg	2009	Clanwilliam	Buchu oil - A. betulina - A. crenulata Buchu tea Buchu dry leaf Buchu powder	15 ha A. betulina	50 %
CAPE KINGDOM		Bloubergstrand	Buchu capsules Buchu water Buchu cream and gel Line of buchu dog health products		100 %
Waterfall Health Farm	1969	Paarl	Buchu oil - A. betulina - A. crenulata - Hybrid buchu Buchu water Buchu resin	N/A	100 %

 Table 5: The six major processing companies of the local buchu industry

² Puris declined to be interviewed. All information related to the company was sourced from the company's website.

The different actor categories identified and their role in the local buchu industry are compared in Table 6. In summary, rural communities fulfil a small part as primary producers of the buchu supply chain, collectively producing around 7 % of the buchu raw material available to the market. Around half of the buchu available from rural communities is in the form of wild harvested buchu, supplied by the harvesting communities of Algeria and Elandskloof, while the other half accounts for cultivated buchu from small-scale farming operations at Genadenberg, Elandskloof and Heuningvlei. It should be noted that percentages in Table 5 are based on volumes available and not exact volumes traded for which data is unavailable. Thus, while Heuningvlei's buchu is included in the 4 % of the buchu made available by small-scale farming operations, Heuningvlei's buchu has not been harvested and, in reality, contributes 0% to annual buchu traded. Similarly, while the harvesting communities of Algeria and Elandskloof have 17 tons of buchu available, in total only 7.5 tons was recently harvested which is less than half of the buchu the two communities have available. This is an indication of how wild harvesters' roles in the buchu supply chain have diminished drastically since the establishment of large-scale buchu production by commercial plantations. Large-scale farming operations serve as the primary source of buchu raw material. Notably, commercial farming operations are not solely in the hands of commercial farmers but are also carried out in almost equal measure by select processing companies (Table 6), reflecting a high degree of vertical integration in this industry.

Act	or	Role	Contribution of buchu available to the market
1)	Rural communities a)Buchu harvestersb)Small-scale buchu farmers	 Primary producers of buchu ra material Contributes to labour force f local buchu industry Primary producers of buchu ra material 	$\pm 3 \%$ For $\pm 4 \%$
2)	Large-scale buchu farmers	 Primary producers of buchu ra material 	w ± 49 %
3)	Members of industry (traders, processors, exporters)	 Primary producers of buchu ra material Traders and processors of buch raw material Suppliers of buchu products the local and internation market 	thu $\pm 44\%$ to the state of th

Table 6: K	Key actors	of the local	buchu	industry
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4.4.2 Local buchu market

Buchu plant material is processed into dried leaves, extracts, powder, buchu water and essential oil. A variety of cosmetics, health products and herbal medicines that contain buchu in its various forms can be found in health stores and pharmacies worldwide. The plant is increasingly also being used as a flavouring ingredient in cooking and cocktails, especially in the Western Cape. Buchu, however, retains its highest commercial relevance in the international fragrant and flavour industry for its essential oil. Buchu oil's characteristic minty, blackcurrant aroma is used in a wide range of flavour and fragrant formulations to impart such characteristics. The presence of the sulphur containing compound, buchu mercapton, is responsible for buchu's distinctive flavour and potent smell (Moolla & Viljoen, 2008). The A. betulina species is categorised into two chemotypes, differentiated by the levels of menthone and diosphenol (buchu camphor) in the oil (Collins & Graven, 1996). A. betulina acts as an flavour enhancer, particularly tropical flavours, in various food and beverage products and can also serve as an alternative to blackcurrant flavour (Moolla & Viljoen, 2008). A. crenulata is characterized by high levels of pulegone, which is hepatoxic (harmful to the liver) thereby limiting its usage in the flavour industry (Viljoen et. al., 2006). Both oils are used to add exotic notes to fragrant formulations and also act as a useful fixative (Moolla & Viljoen, 2008).

The export of buchu oil for use in the fields of food technology, cosmetics and perfumery makes up the bulk of the local industry. Very small quantities of buchu oil are locally used in the production of phytomedicinal products (herbal medicines) and nutraceutical products (functional food with health benefits beyond basic nutrition). For example a prominent local company Cape Kingdom Nutraceuticals' BuchuLifeTM range includes sparkling herbal water, urinary tract infection relief capsules, joint health capsules and first aid gel. The bulk of the local trade is that of dried leaves for buchu tea production and for use in tea blends. Some dry leaf is also exported.

Information about the volumes of buchu traded is difficult to obtain both due to its application in various industries and because processing companies are unwilling to disclose these volumes or their importing clients in order to avoid compromising their position in the highly competitive market. The industry is infamously fractured and secretive. Failed attempts by local producers to co-operate and a history of undercutting have further diminished transparency and communication. An estimated 80-90 % of the buchu produced in the country is used for the production of essential oil (Respondent 10, pers. comm., 2015) Lubbe & Verpoorte (2011) reported that buchu oil production was less than 50 tons a year in 2008. Information obtained from 2015 interview data estimate the production figures to be as low as 6-10 tons of oil annually. At an average oil yield of 1 % (*A. crenulata* yields on average 1 % while *A. betulina* can produce up to 1.2 % oil) this figure translates to approximately 600-900 tons of wet material. Approximately 70 % of the oil produced is exported to European flavour and, to a lesser extent, fragrant houses (Respondent 5, 10, pers. comm., 2015). The main importers of buchu oil are Germany, Switzerland, and France and to a lesser extent the United States of America.

The biggest challenge experienced by the industry presently is the low price of buchu (Respondent 3, 7, 8, 9, pers. comm., 2015). The current price for the plant in its raw material form is R9-R13 per kilogram while buchu oil is sold at R1 000-R2 500 per kilogram. Taking into consideration average production figures, total oil sales amounts to just below R20 million per annum. Interestingly, in contrast to the time of the price peak, *A. crenulata* is presently fetching higher prices than *A. betulina* while a market for hybrid buchu also exists. The price of buchu is controlled entirely by international buyers and suppliers have little negotiation power due to the competitive marketplace. Furthermore, supply and demand is influenced by the ability to store buchu oil for up to five years.

According to industry respondents, it is barely economically viable to distill and export buchu oil at current price levels. One respondent (Respondent 7, pers. comm., 2015) went as far as to describe the once lucrative industry as a now "marginal business." Although the unsustainable price of buchu is a major concern, current role-players remain committed to the trade. Having invested a considerable amount of resources into their businesses, none of the respondents consider exiting the industry any time soon despite minimal returns. Industry members are also well aware of the erratic nature of the trade and run their business accordingly through diversification and other risk-reduction management strategies. Furthermore, family-owned businesses and long-standing involvement in the industry add a sense of sentimentality which bolsters commitment. Due to low prices and a highly competitive marketplace, however, limited expansion of business is occurring locally. Some respondents were of the opinion that the price is expected to continue its upwards trajectory

and rise to a more sustainable level but that reaching price levels of the past were unlikely due to the present surplus buchu available.

According to respondents, entering the local buchu trade as a newcomer is close to impossible owing to well-established trading relationships and the highly monopolistic nature of the market. The lack of access to trading information further hinders market entry. The majority of the industry respondents were of the opinion that the market is currently saturated and that there is little to no room for growth for buchu within the flavour and fragrant industries. The herbal and medicinal market still holds potential since little empirical research has been completed on the medicinal properties and therapeutic effects of buchu (Moolla & Viljoen, 2008). With the current global emphasis on health and well-being there is the possibility for the development of "natural" products that are centered on buchu as the main natural ingredient and that are marketed as such (Respondent 7, pers. comm., 2015)

4.5 CONCLUSION

This chapter reported on the empirical objectives of the study which introduced the local context in which the plant is extracted, used and traded. Historically, the trade has been dynamic in nature with a marked interplay between the wild collection and cultivation of the plant. The chapter has shown that the local buchu industry is small regarding both the volumes traded and the number of actors involved. The chapter also provided a glimpse of the role of buchu in rural livelihoods including the limited part the cultivation of the plant has played in the lives of the rural poor owing to a string of fruitless cultivation projects. The reasons behind these projects' failures are explored in the following chapter within which the social, economic and environmental impacts of buchu cultivation are discussed.

5.1 INTRODUCTION

This chapter will primarily address the last two objectives of the study which are, 4) to determine the social and economic impacts of buchu cultivation and, 5) to explore some of the environmental issues surrounding buchu cultivation. The first section discusses the livelihood benefits that have stemmed from cultivation, the impacts of cultivation on the wild buchu harvesting communities of Algeria and Elandskloof and the role that the most pertinent laws and regulations that govern buchu cultivation and the buchu trade in general, have fulfilled in the lives of rural communities involved in the buchu trade. The second section does not attempt to do a detailed assessment of the environmental impacts of buchu cultivation, which is naturally multi-faceted and requires a detailed analysis beyond the scope of this study, but rather highlights some of the apparent environmental implications that were brought to light during the study. Lastly, the conservation of buchu and the specific role of cultivation in ensuring the sustainability of the plant in the wild are discussed. The main findings of the chapter are presented in Tables 6 and 7.

5.2 SOCIAL AND ECONOMIC IMPACTS

5.2.1 Monetary and non-monetary benefits from cultivation

Thus far, the cultivation of buchu has provided negligible monetary and non-monetary benefits to the rural communities involved in the buchu trade. At best, commercial cultivation has provided seasonal employment to farm workers on buchu farms. Seasonal employment opportunities afforded by buchu are low as overall work only lasts a few weeks. A major buchu supplier said that he employs seasonal workers for a maximum of 10 working days (Respondent 10, pers. comm., 2015). One farmer said that his buchu farming operations of 7 ha provides about 70 man days of labour a year (Respondent, 5, pers. comm., 2015). Another farmer said that she employs 12 additional day labourers to help cut and sort buchu leaf during harvesting season (Respondent 1, pers. comm., 2015). Day labourers are paid between R1 - R3 a kilogram, requiring them to cut between 40 kg - 120 kg a day in order to earn minimum wage.

The absence of substantial and direct benefits from cultivation being realised is attributed to failed attempts at implementing small-to medium-scale buchu cultivation (1.5 ha-10 ha) enterprises initiated by a range of external role-players including local government, the provincial conservation authority CapeNature, research institutions such as the CSIR and the ARC, local NGOs and the private sector. Projects at Algeria, Elandskloof, Heuningvlei and Genadenberg were prompted out of concern that buchu was under threat due to overharvesting and further motivated by the economic opportunities cultivated buchu presented to impoverished communities. Assisting rural communities to establish cultivated buchu crops was, firstly, viewed as a means to relieve the strain experienced by wild populations and, secondly, to aid in livelihood development through providing a source of income to the rural poor.

However, as reported in the previous chapter, buchu cultivation initiatives at Algeria and Elandskloof collapsed soon after implementation allowing little time for financial benefits to accrue. The three remaining Elandskloof farmers have earned some money from their cultivated buchu but can only benefit from their crops when a harvesting permit for the community's buchu is secured as an individual permit is too costly to obtain for the volumes harvested. Moreover, crops are barely viable after years of neglect. One farmer stated that he was considering removing his buchu as earnings every other year do not outweigh the input required to maintain the crops (Respondent 17, pers. comm., 2015).

The cultivated buchu at Heuningvlei has received no return on investment a decade after project implementation. According to farmers a buyer for their cultivated buchu was never secured by external project initiators (Respondent 18, 19, pers. comm., 2015). Owing to the farmers' unfamiliarity with the market environment and their lack of business skills, they have been unable to enter the market – which is notoriously impenetrable. The remoteness of the community further impairs their ability to promote their product. Moreover, the community was not provided with all the necessary equipment to distil the buchu for the production of buchu oil and has not had the available funds to purchase it. Help has repeatedly been sought from the local agriculture department to secure the necessary permits and to assist in producing the oil or selling the cultivated buchu to local processing companies. At the time of the study, the community was waiting on a buchu farmer who was potentially going to purchase the buchu but no official arrangements were yet in place.

While non-monetary benefits are more difficult to assess and quantify it is safe to assume that the short lifespan of projects at Elandskloof and Algeria and the poor performance of the enterprise at Heuningvlei have not allowed much opportunity for community development. It could be argued that cultivation projects resulted in knowledge transfer and skills development as community members were provided with training on buchu cultivation and were educated on buchu conservation during project facilitation. However, exchange of technical knowledge appears to have been limited indicated by the unsuccessful growing of crops at Elandskloof and the failed buchu nursery at Algeria. Although buchu crops are wellestablished at Heuningvlei, farmers said that they were not sufficiently trained to distil the buchu (Respondent 18, 19, pers. comm. 2015). Furthermore, no degree of empowerment of communities was achieved, evident in the general unfamiliarity of the market environment and the extent of the buchu industry amongst harvesters and farmers (Table 6). Although respondents correctly attributed the slump in price to the flood of the market after an increase supply of cultivated buchu, they were not very knowledgeable about the final products that buchu forms part of. They were mindful of the fact that buchu is distilled for its oil and that it is used in the production of cosmetics but they were completely unaware of the fragrant and flavour properties it is most valued for. Lastly, no infrastructure development emanated from either of the projects.

The most often cited reasons for the failure of buchu cultivation projects at Elandskloof and Algeria were difficulties experienced with the cultivating process (Respondent 14, 15, 17, 24, 27, pers. comm., 2015). Some respondents also blamed inadequate support from project initiators whose untimely exit meant farmers were left unaided to recover dying buchu plants and to navigate a hostile market environment when the buchu market crashed shortly after project implementation (Respondent 14, 17, 26, pers. comm., 2015). Indeed, two interviewees questioned the commitment of a processing company and the intentions behind their involvement at Algeria and Elandskloof as the projects allowed the company to harvest highly sought after buchu seeds from within the protected CWA from which these companies established their commercial buchu plantations (Respondent 4, 17, pers. comm., 2015). Heuningvlei farmers provided similar reasons stating that a market for their buchu was never secured by project initiators and that they were unable to secure a buyer without assistance (Respondent 18, 19, pers. comm., 2015). A commentator involved in the project at Elandskloof stressed that unfavourable power relations within the community and the lack of leadership were the key contributing factors that led to its collapse (Respondent 7, pers.

comm., 2015). These three cases illustrate how cultivation is a resource-intensive process which is hindered by financial constraints and technical difficulties. Moreover, that development interventions such as cultivation initiatives require long-term commitment from initiators, sufficient funding and ongoing capacity support to overcome, especially, market-related project challenges in order to ensure that project goals are reached.

Despite past failures, the majority of harvesters interviewed asserted that they would be interested in cultivating buchu again as it would allow for yearly harvesting and would be less laborious than harvesting in the mountains. Harvesters, however, acknowledged a number of limitations that hinder cultivation and did not envision cultivation occurring without external assistance (Table 6). Two harvesters from Algeria remained hesitant about cultivating buchu stating that buchu is a "natural thing" that "belongs in the mountains" and should not be domesticated (Respondent 13 & 24, pers. comm., 2015). There is also the general impression amongst both Algeria and Elandskloof harvesters that "berg-boegoe" is of better quality than cultivated buchu, regarding both medicinal strength and oil content which further explains some reluctance.

While the still operational buchu cultivation and distillation project at Genadenberg can be cited as a success story, whether project aims have been reached and whether significant benefits have been realised remains uncertain. The project has provided permanent employment to one male farm manager and two female labourers who together are responsible for the maintenance of the buchu crops and the once a year extraction of the buchu oil. In addition, ten labourers are employed during harvesting time to help cut the buchu. However, the sale of the oil is managed by an outside local buchu farmer who fulfils a mentorship role at the farm and the income from sales is managed by the church. Thus, the initial goal of women's empowerment is not evident as the two female employees are paid daily wages and are not fully integrated into business operations. Furthermore, it was intimated that not all employees are satisfied with their working conditions. In the light of this as well as claims of mismanagement (Anon., pers. comm., 2015), the accomplishments and future sustainability of the enterprise can be called into question.

5.2.2 Impacts of cultivation on harvesting communities

A direct implication of the increased commercial cultivation of buchu has been a decreased demand for the more costly to harvest wild buchu. This is a concern to the harvesting

communities of Algeria and Elandskloof where the harvesting of wild buchu has formed an important part of their livelihoods despite great fluctuations in value.

In the past, buchu provided significant incomes to both harvesting communities, especially, Elandskloof. While Algeria caught the tail-end of the price "boom," Elandskloof's buchu earned the community up to R300 000 a harvesting season when buchu's value was at its peak. The mountain land of Elandskloof produces the diosphenol chemotype of *A. betulina* which was the most sought after type of buchu at the time. In 2001, buchu sales settled the farm's debts after providing a reasonable income to harvesters (Respondent 17, pers. comm. 2015). One respondent recalled how he was able to afford a vehicle after the household pooled their income one harvesting year (Respondent 20, pers. comm., 2015).

Presently, income earned from harvesting varies across individual harvesters and is dependent on the volume requested and amount paid by a buyer as well as the number of community members that decide to partake in harvesting. Algeria harvesters earn between R600-R900 a harvesting season, while at Elandskloof, with almost eight times more buchu available, income ranges from R500-R3 000 per harvester. Overall, respondents were generally disheartened by the present low economic value of buchu which rendered it inferior to other sources of income. Some Elandsklowers went as far as to say that buyers purposefully pay low prices for Elandskloof's buchu to increase their own profits. This is, however, a mistaken belief as similar prices are paid for raw material from different sources by different buyers.

Despite meagre earnings, harvesters from both communities asserted that they will continue to participate in harvesting buchu, even at similarly low prices. A number of harvesters linked the importance of buchu to their job security. Two harvesters stated, "If I don't work then it is very important" and "I will still harvest if I don't have work." At Elandskloof, very few community members are formally employed, thus the majority are highly reliant on seasonal work as a source of income (Williams, 2005, Respondent 23, pers. comm., 2015). While the economic situation is better at Algeria, (with over 75 % of households earning above the R6 401 monthly income bracket) (Wilson, 2015), at the time of the study the community was especially afflicted with high unemployment rates as a CapeNature project that employed a number of members had just been completed (Respondent 15, pers. comm. 2015). Accordingly, unemployed members were anxiously waiting on the harvesting permit to be issued in order to harvest and sell buchu to provide for immediate household needs.

Respondents said that money earned from harvesting buchu is generally used for everyday household expenditures. Some respondents mentioned that income from buchu especially helps ease cash flow problems experienced after the holiday season and that earnings specifically contribute to school expenses as the harvesting season coincides with the start of the school year (Respondent 20, 21, pers. comm. 2015). Therefore, at Algeria and Elandskloof the harvesting of buchu represents a necessary financial injection for harvesters especially at times of unemployment.

The communities of Elandskloof and Algeria have been able to secure a buyer for their buchu over the last few harvests as one processing company has developed a good relationship with the community leaders of these communities (Respondent 8, 15, pers. comm., 2015). However, the agreement to buy the communities' buchu remains informal and would require a formal arrangement to ensure that benefits are secured. Furthermore, the fact that raw material can be sourced less costly from commercial buchu plantations means communities have little power to negotiate selling price.

An indirect social consequence of implemented buchu cultivation projects was evident in the case of the Elandskloof community. The launch of the buchu cultivation project in 2006 caused conflict amongst community members as only a select few with the necessary space to cultivate could initially participate in the project and reaps the potential benefits. The project was initiated at a time the community was divided over the leadership structure and was used as leverage in community power relations (Respondent 7, 17 pers. comm). Thus, the project fell fall short of its goal of community upliftment and instead worsened existing tensions in the community (Williams, 2005; Respondent 7, 17, pers. comm., 2015).

5.2.3 Impacts of legislation

While a full assessment of the laws that govern buchu commercialisation is beyond the scope of the study, reporting on implementation issues surrounding benefit-sharing is pertinent to the socio-economic context of the buchu trade.

The San and Khoi, as the original inhabitants of South Africa, claim to be the indigenous knowledge holders of the medicinal use of buchu and thus holders of certain legal rights to share in the benefits stemming from the commercial development of the plant. These assertions are supported by the literature and have been acknowledged by the Department of Environmental Affairs (DEA) and certain industry stakeholders who have concluded benefit-

sharing agreements with the South African San Council and National Khoisan Council (NKC), who represent the San and Khoi peoples of South Africa at a national level, as provided for by the national Bioprospecting, Access and Benefit-Sharing (BABS) legislation. According to the regulations, entities that trade buchu, do research on buchu for commercial purposes or utilise buchu in the production of essential oils, food flavours, cosmetics, fragrances, extracts, medicines and neutraceuticals are required to apply for the relevant permit and enter into agreements with relevant communities or representatives of populations that are traditional knowledge holders.

According to the DEA (2015), the issuing authority, there have been no major challenges with the implementation of BABS regulations for buchu apart from the fact that the scale of trade and the size of the local industry have been difficult to establish (DEA, pers. comm. 2015). The DEA has, however, been actively engaging with the local buchu industry, providing assistance with the permit application process and offering support with stakeholder engagement for the purpose of securing necessary agreements. At the time of the study, four bioprospecting permits for buchu had been issued and seven permit applications were under consideration by the issuing authority (DEA, pers. comm., 2015).

While the national BABS regulations have to a degree safeguarded the rights of the holders of buchu traditional knowledge through the establishment of benefit-sharing agreements with representative councils, it appears they have not empowered those that are directly involved in the buchu trade. This is evidenced by the lack of current community-based initiatives or formal benefit-sharing agreements that attempt to better integrate the rural poor into the trade to allow for the share of commercial benefits. Comments of harvesters such as "we don't have much say in what happens after they take the buchu away" demonstrated the limited involvement of rural communities (Table 7).

Furthermore, harvesters and small-scale farmers, were wholly unaware of the regulations that protect the rights of traditional knowledge holders and that provide for fair compensation of commercial activities. Questions on traditional knowledge and benefit-sharing were generally very poorly understood and interpreted by respondents. While some recognised that the medicinal uses of buchu have been passed on for generations a sense of ownership of this knowledge was not apparent. A few respondents briefly referred to the San and Khoi who they knew to have used buchu in the past but they did not explicitly classify themselves within these groupings. Although communities do not strongly identify with these "original"

knowledge holders they nonetheless hold knowledge of buchu - knowledge which has been acquired over some centuries and which is still utilised today. While it was difficult to gauge interviewees' attitudes towards benefit-sharing without prompting answers, it appeared as if they had no expectations to share in the profits of buchu commercialisation despite being contemporary knowledge-holders and present stakeholders in the buchu trade.

Issues surrounding ownership of knowledge and fair compensation also emerged during interviews with industry representatives and commercial farmers who answered questions on the measures in place for access and benefit-sharing either hesitantly or dismissively (Table 7). Distillers and farmers generally acknowledged that the medicinal use of buchu in commercial enterprises constitutes the appropriation of traditional knowledge, but not the application of buchu essential oil for fragrant and flavour purposes. Consequently, respondents largely disagreed with the notion of benefit-sharing with the San and the Khoi. Processing companies interviewed who do not have a benefit-sharing agreement in place, claimed to be in the permit application process but often expressed their dissatisfaction with the lengthy and complicated procedure and the costs involved. Buchu farmers were especially ill-informed about the national BABS regulations and were not aware of legal implications.

Deficient knowledge of the legal and regulatory environment is a major disadvantage to harvesters who already have a limited capacity to enter the trade and share in the benefits of buchu commercialisation. The industry's ignorance or misconceptions of their legal responsibilities and tentative compliance further negates the function of relevant laws and regulations. It should, however, be acknowledged that poorly formulated legislation and subsequent amendments have complicated adherence by industry and have delayed effective implementation. The study took place during a period of regulatory transition with the drafting of the IKS Bill (20 March 2015) and the amendment of the national BABS Regulations (19 May 2015), which makes commenting on the overall efficacy of regulatory provisions and models for benefit-sharing difficult.

Table 7: The social and economic impacts of buchu cutivation

SOCIAL AND ECONOMIC IMPACTS			
Main findings (Respondents)	Quotes (A)=Algeria harvester, (E)=Elandskloof harvester/farmer, (H)=Heuningvlei farmer, (F)= Commercial farmer, (I)=Industry representative		
Buchu cultivation has provided negligible benefits to the rural communities involved in the buchu trade (13, 14, 15, 17, 24, 25, 26, 27, 28, 30)	 "[cultivation] was a giant failure" (24) (A) "we have made no money out of the buchu" (25) (H) "We didn't have training to use the steamerthe machine arrived here without a gas bottle" (25)(H) "for the project it was a couple of thousands of Rands - over R200 000 of a project - and we have benefitted nothing from it" (25)(H) 		
	"buchu's benefits are only for the people that distil it and export it" (17)(E)		
Goals of cultivation initiatives have not been reached - the reasons for failures are multiple and interrelated (13, 14, 15, 17, 24, 25, 26, 27, 28, 30)	 "We could harvest once. Thereafter the roots started to rot, we had a heavy kick-back, the money was finished, the community unfortunately did not have the money to take the project forward(15)(A) "those specific years the price of buchu dropped and then it wasn't economically effective to maintain the buchu nursery. And the big thing was then that they withdrew. They just did the donation and they trained the people a little bitand then we had to continue but we didn't have the funds" (14)(A) "we don't have a market. We don't know wherewe can harvest, but then what do we do then? And we don't have a permit" (26)(H) "[Private company] only supplied the seedlings. Then, laterthey were going to make provision but when the things were planted, they were gone. They were supposed to buy the buchu back from us. But then [private company] planted a terrible lot of buchu, then he said he had enough buchu" (17)(E) "The biggest challenge is leadership within communities. You get involved in political conflict within the community and it simply becomes a difficult and sensitive scenarioThe buchu business failed because the community structure was not present" (7)(I) 		
Cultivation projects initiated by external role-players caused conflict within Elandskloof community (7, 17)	"The difference came in exactly with that buchu planting. When the buchu planting started, they were angry. Look, there wasn't for everyonefor every household a hectare of buchu. They wanted to put up a place [distillation facility] but that is when the people became divided" (17)(E)		

Cultivation is positively viewed by harvesters	"buchu [cultivated] can be beneficial over the long-term if a man knows where you can sell it there must be market for it" (25)(H)
who remain interested in farming buchu,	"It will be a massive injection for us here at Elandskloof" (20)(E)
contingent on external assistance	"I would be interested if I get the support. Everything starts with finances. I've I don't get funds then I won't" (27)(A)
(13, 15, 17, 20, 23, 25, 27, 31)	"I would be interested but I don't have land, we don't have the land for it. We are a community and if someone starts with buchu then everyone will want to begin and they'll revolt. There has been some 'head-butting' over guys that want land and there are always objections. A guy can't continue by himself" (13)(A)
Increased commercial cultivation has contributed to a diminished demand for	"there is an oversupplyThere isn't a market for the wild because some of the components in it are very different to the other oilso the general market for buchu oil is not the wild stuff. It's cultivated now (1)(F)
wild harvested buchu (1, 4, 6, 7, 10, 22, 24)	"it's all a process – you have to go up and down the mountain. But if you plant it in rows it's easier. So we mainly focus on cultivated material because it's easier and quicker and you know what you are getting " $(22)(I)$
	"At the moment wild buchu is too expensive to go harvest. It takes too much effort, too much time, too much petrol, too much labourand buchu is not at a price at the moment that would actually be sustainable to do that, so we rather go for plantations" $(4)(I)$
Buchu harvesting forms an important part of	"it's our life - the buchu making. ³ " (31)(A)
community livelihood, especially to the poorest members and the	"it is not a big income but what makes it important for the community is that it puts food on the table – that's the big impact" $(15)(A)$
unemployed	"It's important, especially becausewe are unemployed hey? And to cut buchu is at least an income. Then you at least have some bread on the table" (27)(A)
(14, 15, 20, 21, 24, 27, 29, 31)	"If I don't work then buchu is very important" (29)(E)
	"if you don't harvest the year then you feel, you feel a void" (20)(E)
National BABS regulations have not	"I am only a part of the harvesting processthe processing I am not" (24) (A)
empowered those that are directly involved in	"We only know when we must go harvest. Other than that we know nothing" (27)(A)
the trade	"It is just a personal agreement we have with her [the buyer]. The disadvantage is we just cut the buchu. [buyer] then comes to fetch the buchu and how they process the
(1, 14, 15, 17, 24, 25, 26, 27)	buchu furtherthat we have nothing to do with. I can really not saywhat [buyer] does with the buchu" (15)(A)
	"It is the guys that buy. It is them that keep the price so low. And it is them that tell us that the market is low. Because we don't supply the market, they do the market provision. Now they can do with us what they like because we need to work through them to sell our buchu" $(17)(E)$

³ Elandsklowers refer to the harvest and trade of buchu as "boegoe maak" in Afrikaans which directly translates to "buchu making."

BABS regulations and associated concepts are either unfamiliar to, or generally negatively perceived by commercial farmers and industry	"The leaf, yes. The oil, nothey knew something in the leafwas good foranti- toxins. But they didn't know that the oils could be used as a fixative or as a flavour enhancer. And then they say 'I want my royalties for doing nothing please.' Anyone and everyone that is KhoiSan now want royalties, whereas buchu was only in this little area. If you go to the KhoiSan who are in the Kalahari desert or in Namibia – there was never buchu there (5)(F)
representatives	" we deliver buchy to [company] who has certain products which they cell which
(1, 2, 4, 5, 7, 8 11, 10)	you can maybe trace back to the initial medicinal, anecdotal claims which were made then but that are a very small market. The buchu industry has grown or is primarily based on the pillar of the flavour industry which has sweet nothing to do with functionality. So there cannot really be claims made for it" (7)(I)
	"the fact that we are already making such small profits but we have to do this whole bioprospecting and there is just so much red tape that gets involved and we have people who have been here for 100 years but we can't make a contribution to them, we have to give our money to somebody in Kimberley" $(1)(F)$
	"I don't know how far things have developed with councils that receive money. I don't mind if that happens but then it must be descendants of people that used itBecause a lot of the time it is unfortunately some lawyer or council that makes the money $(4)(F)$
	"I am not too familiar with all that. All I do is try and do everything as legal as I possibly can but the process in itself is quite long and a lot of the timeit is a good thing but if you approach a company like ours that's not making a lot of moneyI don't find that fair you know. (4)(I)

5.3 ENVIRONMENTAL IMPACTS AND SUSTAINABILITY

5.3.1 Cultivation

Land degradation and habitat loss are the main environmental concerns associated with buchu cultivation. For optimal growth buchu should be planted in virgin soil (i.e. soil that has not been cultivated before). As a result, newly planted crops have resulted in the removal of naturally occurring, virgin mountain fynbos and possibly the heavily threatened renosterveld - the other major vegetation type of the region.

A further concern is that attempts at planting buchu elsewhere in the country have been largely unsuccessful. The implication of this is that any growth in the industry and subsequent expansion of cultivation will be confined to the Western Cape and the already threatened Cape Floristic Region (CFR). A closer look at the vegetation maps of the locations where buchu is currently cultivated, namely Piketberg, between Citrusdal and Clanwilliam, and the Klein Drakenstein/Paarl area, showed that any expansion will very likely impact on a number of threatened ecosystems listed under the National Environmental Management:

Biodiversity Act (NEMBA) (10 of 2004). Of particular concern is the critically endangered Swartland Shale Renosterveld which is one of the major vegetation types around Piketberg and in the Klein Drakenstein region (Mucina & Rutherford 2006). Other threatened ecosystems present where buchu is cultivated include Piketberg Sandstone Fynbos, Leipoldt Sandstone Fynbos, Cederberg Sandstone Fynbos and Boland Granite Fynbos, all of which are listed as vulnerable (Mucina & Rutherford 2006). Environmental laws that require a ploughing permit or the completion of an Environmental Impact Assessment (EIA) before land can be cleared are in place to prevent habitat destruction, at least on paper, and require strict implementation to prevent environmental degradation and biodiversity loss.

Soil nutrition depletion and topsoil erosion are also major environmental concerns arising from intensive mono-crop cultivation. Although soil depletion was not reported by farmers it is an ongoing concern for rooibos production which is planted in the same region, in the same fynbos type soils although farming practices are not completely alike (Pretorious et al., 2011).

A direct environmental implication of buchu cultivation has been instances of cross-breeding between cultivated plants and wild populations. Hybridisation has occurred between cultivated *A. crenulata* species and wild populations of *A. betulina* in the Klein Drakenstein area (Paarl) of which the hybrid species has become commercially important (Hüsselmann, 2006). More cross-breeding is possible due to the general close proximity of cultivated plots to wild buchu populations. However, the exact ecological implications of buchu cross-breeding have not been studied or reported on. Cultivated material holds the potential to negatively impact on wild resources as unwanted cross-breeding results in the introduction of unwanted gene material and a reduction in genetic diversity (Youn et. al., 2003; Leakey, et. al., 2005).

Overall, buchu cultivation can be considered to be less environmentally destructive than other monocultures that are intensively farmed in the region (Respondent 5, pers. comm., 2015). After establishment, buchu is a low input crop requiring little water and fertiliser. On average buchu requires 6-7 litres of water per week per plant by drip irrigation, only during the summer months (Respondent 11, pers. comm., 2015). Buchu can also be farmed as a dryland crop. Furthermore, most farmers employ organic farming principles and do not make use of any insecticide, pesticide or herbicide which could be environmentally damaging. Crops are occasionally organically fertilised and all weeding is done by hand.

5.3.2 Conservation

All buchu species are legally protected under the 1974 Nature and Environmental Ordinance (Ord. 19, 1974) of the Western Cape. Neither *A. betulina* nor *A. crenulata* are listed as a threatened or protected species under NEMBA which would afford it priority protection. Buchu is also well conserved by large populations falling under the protection of the Cederberg Wilderness Area (CWA) which prohibits any harvesting of the plant.

The trade of buchu is regulated by the provincial conservation authority CapeNature. Buchu producers are required to apply to CapeNature for a licence to cultivate, with no costs involved. To harvest buchu, harvesters are required to apply for a harvesting permit which is issued after an inspection of the resource by CapeNature during which allowable volumes to be harvested are determined (CapeNature, pers. comm. 2015). A permit is required for harvesting both wild buchu and cultivated buchu and is valid for one year at a cost of R250 (CapeNature, pers. comm. 2015). Worryingly, a few buchu farmers remarked that the renewal of permits for harvesting cultivated crops is not being strictly monitored (Respondent 2 & 5, pers. comm., 2015). This raises questions about how rigorously the permit system is being implemented for monitoring overall trade which may include undetected wild harvesting.

According to respondents the shift in production from wild to cultivated sources has undoubtedly removed harvesting pressure from wild populations and has been welcomed as a conservation strategy by conservation authorities (CapeNature, pers. comm., 2015) (Table 8). Harvesters too were generally not opposed to buchu being cultivated and recognised the role it has played in conservation of the species. This was especially true amongst Algeria harvesters who are collectively a conservation-orientated community due to their long established affiliation with local nature conservation and close proximity to the CWA. Community members interviewed, however, asserted that frequent but sustainable harvesting is required for wild populations to flourish.

The overexploitation of wild buchu is not a current conservation concern for nature conservation authorities at a provincial and national level (CapeNature, pers. comm. 2015; DEA, pers. comm. 2015) (Table 8). According to government officials, conservation specialists and buchu farmers, there have been no recent major instances of illegal harvesting recently (CapeNature, pers. comm. 2015; DEA, pers. comm. 2015). At current prices, the

price reward is simply not worth the effort or the risk of being caught. Correspondingly, Algeria and Elandskloof harvesters agreed that buchu is growing in abundance on communally-owned mountain land and there have been no major changes in the size of populations over the last decade. Harvesters asserted that they always employ the correct harvesting techniques to ensure populations are sustained for subsequent harvesting years. They added that buchu is well protected by nature conservation authorities and that the implemented permitting system limits possible threats. Mixed responses were provided by harvesters as to whether the poaching of buchu is a problem. While some harvesters asserted that it is no longer an issue, others mentioned that the "bossiedokters" or "Rastafarians" often harvest illegally in the mountains.

While nature conservation authorities do not consider buchu as a priority species at present, both commercial species are, however, categorised as *declining* under the national red data list by the South African Biodiversity Institute (SANBI) (Raimondo et al., 2009). The national red data list makes use of the standards and criteria of the International Union on the Conservation of Nature (IUCN) to assess the conservation status of indigenous species. As a *declining* species *A. betulina* and *A. crenulata* are not in danger of extinction, but are considered of conservation concern as there are threatening processes causing a continuing decline of the two species (SANBI, 2010). The reason for the difference in viewpoint is most likely due to the last census being done in 2008. Since then, wild harvesting has decreased significantly which predictably has had a positive impact on wild populations.

Although the unsustainable harvesting of buchu is not a current concern, it is believed the high value of buchu and market demand in the past adversely impacted wild buchu populations (de Ponte Machado, 2003; Coetzee, 2004; Trinder-Smith & Raimondo, 2008). This is because too frequent harvesting of large volumes at incorrect times of the year resulted in lower regrowth rates and limited seed production (de Ponte Machado, 2003, Coetzee, 2004). Although not well documented, the population decline of *A. betulina* and *A. crenulata* is suspected to be less than 10 % and 20 % respectively (Trinder-Smith & Raimondo, 2008).

In line with past trends, it is safe to predict that cases of overharvesting and illegal harvesting will increase with expanding demand and an accompanying rise in buchu's value. These sentiments are shared by nature conservation authorities who are closely monitoring the price of buchu (CapeNature, pers. comm., 2015). The response of nature conservation authorities

to a price increase will be to intensify their security presence in and around the CWA and to implement more frequent spot checks of harvesting permits (CapeNature, pers. comm., 2015).

Main Findings (Respondents)	Quotes (A)=Algeria harvester, (E)=Elandskloof harvester/farmer, (H)=Heuningvlei farmer, (F)= Commercial farmer, (I)=Industry representative, (CN)=CapeNature, (DEA)=Department of Environmental Affairs
Land degradation and habitat loss are the main environmental concerns of buchu cultivation	"You need natural fynbos soil. If you had something else on the land, say now something like fruit or vineyards and you plant buchu, you will have problems. So your input is to clear available fynbos land which is becoming a bigger problem because you are not actually allowed to clear land anymore" (2)(F)
(2, 5, 11)	"The biggest challenge is finding the correct soilif it's been previously cultivated and it has phosphate in it, I guarantee you can't grow, you can't grow buchu there" $(5)(F)$
	"Nothing, it was natural vegetation. My uncle ploughed ittook the proteas and fynbos off" $5(F)$
	"this was all just normal fynbos ⁴ " (11)(F)
Cross-breeding has occurred between cultivated buchu and wild buchu (2, 3, 12)	"We have hybrid buchu, which is a cross between the long leaf and the round leaf. And there is a big demand for it at the moment. A few years ago we started selecting for those seeds and I only plant it" (12)(F)
<i>Buchu is a low input crop</i> (1, 2, 11)	"I have some fields that I don't water at all and others that I do, maybe once a week or every two weeks. They don't need a lot of water. And I am organic" (1)(F)
	"Everything is organic" (11)(F)
	"I don't irrigate, I don't spray. If necessary then you can fertilise – organic fertiliser" (2)(F)
	"More buchu is killed by overwatering and overfeeding than from anything else. It's an organic plant. I don't give chemical fertiliser but I do give organic fertiliser" (5)(F)
Cultivation has removed harvesting pressure from wild populations	"it is something good [cultivation]. Because it immediately takes pressure off natural buchu" (15)(A)
(15, 6, 7, CN)	"All the buchu we buy now is cultivated. We get no wild buchu. So that would indicate that the cultivation of buchu has certainly de-stressed the natural resource" $(6)(I)$

Table 8: The environmental impacts associated with buchu cultivation

ENVIRONMENTAL IMPACTS & SUSTAINABILITY

⁴ Field notes

	 "wild buchu is still reasonably safe because no-ones goes into the mountains anymore" (4)(F) "because no one really cuts here. So not in this area, I don't think it's under threat at all" (1)(F) "when the commercial thing [cultivation] started to soar, it impacted on price – prices stabilised. And in the end, the impact that we wanted, there was less pressure on the natural resource. Today, it is simply not worth it at R8/R9/R10 a kilogram, if you're lucky, to go steal buchu in the mountain" (7)(I)
No conservation concerns at present as overharvesting is correlated to price (1, 3, 4, 11, 15, 24, CN, DEA)	 it is all purely linked to price. It is basically looking at the price and for evidence of poaching then we will put a little more of a concerted effort in" CN "There is no poaching presently. The buchu price is too low. And it is effort to get buchu down from there to herebuchu has a very strong smell so your risk is too big for R9 a kilogram. At one stage when buchu was about R60 a kilogram we had a lot of poaching but it had no impact on our buchu" (15)(A) "now that the price of buchu is so low there is not really any threat, theftSo the wild buchu is wild and it does its own thing and you know I can't see it being under threat at all" (3)(I) "We will definitelyfrom a conservation aspectwe will definitely experience problems again because when the price rises, your price per bag seed rises" (15)(A) "If buchu gets expensive again then we will reconsider to harvest in the veld again" (11)(F)

5.4 CONCLUSION

This chapter reported on the socio-economic and environmental implications that have resulted from the relationship between the wild collection and cultivation of buchu. The results revealed that buchu is a minor, but still valuable natural resource to the harvesting communities of Algeria and Elandskloof, especially to the unemployed. However, the benefits of buchu cultivation have been insignificant to the rural poor involved in the trade and, in effect; the increased availability of cultivated sources has decreased the market share of communities' wild buchu. In addition, the implementation of national benefit-sharing regulations has been inappropriate and has not been utilised as a tool to benefit the rural poor who are directly involved in the trade. Regulations appear to serve historical knowledge holders as opposed to contemporary ones. The chapter also reveals that buchu cultivation is not without environmental impacts, however, that overall, the ecological sustainability of the

resource seems promising as cultivated crops have undoubtedly removed pressure from populations that are not being harvested anymore. The perspective of actors in the trade is that wild buchu is not under threat at present despite minor instances of illegal harvesting and neither is buchu conservation a major concern to environmental authorities at present.
6.1 INTRODUCTION

In this chapter, the buchu trade is analysed by discussing the main findings of the study while throughout, drawing parallels with trends and issues present in the NTFP commercialisation discourse. First, the role of buchu in rural livelihoods as a cultivated plant as well as a wild resource is discussed. Second, the extent to which the cultivation of buchu contributes to the ecological sustainability of commercial exploitation is assessed. The last section specifically aims to locate the commercialisation of buchu within the conceptual model developed by Homma (1992), introduced in Chapter 2, and to assess its applicability for the buchu trade.

6.2 THE ROLE OF BUCHU IN RURAL LIVELIHOODS: CULTIVATION & HARVESTING

6.2.1 Limited capacity to engage in cultivation

Intensified management of NTFPs through cultivation in agricultural systems is the logical response to high market demand and an accompanying depletion of the natural resource base (Homma, 1992; Schippmann et al., 2006; Belcher & Schreckenberg, 2007). For the poor, the cultivation of NTFPs provides the opportunity for households to increase their income through increased production and improved quality and timing of production (Belcher et al., 2005). However, the rural poor often do not have access to the required financial capital for farming input, or human capital, in the form of people with the relevant knowledge and skills, to exploit the opportunities presented by cultivation (Crouch & Edwards, 2004; Belcher & Schreckenberg, 2007). Correspondingly, cultivating buchu is largely unattainable to the rural harvester communities of Algeria and Elandskloof primarily because they do not have the financial resources for seedlings, fertiliser and irrigation equipment required to establish buchu crops. Poverty is prevalent amongst Elandsklowers evidenced by high unemployment, the importance of government grants to household income (Williams, 2005) and the lack of access to basic services such as electricity and water - the latter of which also impedes cultivation (Respondent, 23 pers. comm., 2015). While the community of Algeria is better off economically, the community fund is inadequate to provide the necessary start-up capital for cultivation and is already earmarked for other community functions (Respondent 15, pers.

comm., 2015). Harvesters also lack the necessary expertise to successfully farm with buchu which is known to be difficult to cultivate and which they have been unable to successfully grow in the past.

Alongside limited financial and skill capacities, the lack of access to land and insecure land tenure are often major obstacles for the poor to bring NTFPs into agricultural production systems (Belcher & Schreckenberg, 2007). Although the residents of Algeria and Elandskloof have secure tenure, individual plots provide little room for establishing buchu crops at a large enough scale to make sense economically and allotted land is already used for growing produce or keeping livestock which is important for subsistence use and household income. Furthermore, animosity amongst community members may surface should only a select few grow buchu and profit from it, as evidenced by the conflict that arose during the past buchu cultivation project implemented at Elandskloof. Cultivating buchu on a communal basis on community mountainous fynbos land is, however, also restricted. At Algeria, no land-use other than the sustainable harvesting of natural resources is permitted on community land in accordance with the stewardship management agreement with CapeNature (Respondent 15, pers. comm. 2015). At Elandskloof, most of the community land that is arable has been farmed on previously which makes it unsuitable for buchu cultivation which requires uncultivated soils. In the light of the above barriers together with present unfavorable market conditions, cultivating buchu is an unlikely exploit for the harvesting communities of Algeria and Elandskloof, at least in the near future and without considerable financial and technical support from external role-players.

There is also limited scope for value-adding activities stemming from cultivation that can improve the benefits realised from increased management. The distillation of buchu essential oil, for example, entails substantial financial input for distillation equipment and for ongoing expenditures such as maintenance, water and electricity and necessary permits, and requires specific technical expertise, all beyond the reach of rural communities. Communities' abilities to profit from such enterprises are further limited by their lack of marketing capacity and business know-how to enter and compete in a notoriously exclusive market place with certain standard and product requirements. Furthermore, processing facilities require only a few skilled workers, as is the case at Genadenberg which employs only three people, who are trained to operate and maintain the equipment. This raises the issue of how financial benefits from distillation will be shared amongst community members who regard buchu as a communal resource. Such issues would have to be addressed to avoid potential conflict.

6.2.2 Elite capture of benefits

The cultivation of buchu is presently in the hands of large-scale, commercial farmers and processing companies who have the required capital, land, and market connections to engage in cultivation and profit from the commercial trade of buchu. The capture of benefits by wealthier "elites" when a wild resource is domesticated is a common feature of NTFP commercialisation as the low capacities of the rural poor prevent them from engaging in resource-intensive agricultural activities (Dove, 1994; Belcher & Schreckenberg, 2007). Although the limited capacities of the rural poor to cultivate buchu have been previously recognised by research institutions, government and industry, the unsuccessful implementation of projects have failed to secure the benefits that cultivation offers.

A benefit-sharing agreement in the ambit of the national Access and Benefit Sharing (ABS) legislative framework is the provided legal tool to guard against elite capture and ensure the equitable share of benefits from the commercial exploitation of indigenous natural resources. In the case of buchu the San and the Khoi, as historic traditional knowledge-holders, have been the primary negotiators of buchu benefit-sharing agreements as opposed to the rural communities of Algeria, Elandskloof and Heuningvlei who are presently and directly involved in the trade. While the San and Khoi are rightly negotiating benefit-sharing agreements as the undisputable original knowledge-holders of buchu, they do not represent buchu harvesting communities, who despite sharing common ancestry with the San and the Khoi, have a more complex heritage (as is generally the case with South African communities who have evolved across centuries of migration and colonisation, intermarriage and cultural mixing) and do not strongly identify with these groupings. These communities are, however, the contemporary users and traders of buchu and can be considered valid knowledge holders, albeit chronologically later, entitling them to commercial benefits which they have yet to receive. These findings allude to the complex question of how to afford traditional knowledge rights and associated benefits when knowledge is very seldom exclusive to one cultural grouping or population but shared on both a temporal and spatial scale (Chennells, 2013).

Issues surrounding traditional knowledge aside, the BABS regulations present the opportunity for local development through the distribution of benefits to the ground-level, but

these provisions are not stipulated as requirements for agreements and have not been utilised by industry in the process of securing relevant permits that instead chose to compensate representative councils. Lack of engagement with harvester communities can be explained by industry's preference to partner with organised bodies as opposed to initiating possibly timeconsuming and delayed negotiations with less organised communities that are unable to navigate complicated legislative provisions (Wynberg et al., 2015). Similar cases in Southern Africa have revealed that ABS regulations are favouring local elites or traditional authorities that are capturing benefits instead of local harvesters who are sidestepped during the formalisation processes (Wynberg et al., 2015).

Including harvesters in benefit-sharing negotiations is especially important now that harvesters run the risk of being excluded from the buchu supply chain. With wild harvested buchu competing with cultivated material in the market, of which the latter is the desired product due to it being less costly to harvest, the benefits of buchu to communities are not secure without the conclusion of formal agreements. Fortunately, both harvesting communities have been able to secure a buyer for their wild buchu, however, the availability of less costly to harvest cultivated buchu has diminished their bargaining power during price negotiations. Cultivated material is also preferred by buyers because it is favoured by international markets that demand uniformity and traceability and for the opportunity of certification it offers (Schippmann, 2006) which has further shrunk their potential buyer base. Furthermore, while no expansion of cultivation is occurring presently, the expected continued upwards trajectory of buchu's price could once again prompt expansion and further diminish harvester's role as producers of buchu raw material to the buchu value chain.

6.2.3 Challenges for development in an erratic commodity market

Failed buchu cultivation projects at Elandskloof, Algeria as well as Heuningvlei illustrate the difficulties of engaging with communities that have low capacities and limited opportunity for upscaling but high expectations of quick returns and large profits. The visible results of these projects, or lack thereof, shows that the conditions for success of market-dependent livelihood development projects are vast and complex (Fabricius et al., 2004). The case of buchu reiterates the importance of considering project limitations due to associated market risks beforehand and communicating these limitations in order to manage the expectations of those involved. Such expectations also underpin the importance of ongoing assistance to communities to develop and sustain the partnerships necessary to overcome capacity

limitations and to ensure project sustainability. In the case of Elandskloof, community factionalism and conflict certainly contributed to the failure of the cultivation project showing that good social relations and low levels of division are key to ensure successful community-level initiatives related to natural resource management (Fabricius et al., 2004).

Alongside practical challenges, possibly the prevailing reason for the failed attempts at establishing cultivated buchu within rural communities was the drastic price decline buchu experienced during the global financial crisis of 2007/2008. The case of buchu demonstrates that promoting NTFP trade as a strategy for development remains problematic due to volatile international commodity markets that are influenced by changing currency values, consumer preferences and global market conditions resulting in typical "boom and bust" scenarios (Russell & Franzel, 2004; Belcher & Schreckenberg, 2007). Similar price fluctuations have been evident in numerous cases globally, such as uppage (Garcinia Gami-gatta) and kava (Piper methysticum), both of which experienced a drastic drop in sales after studies refuted supposed medicinal benefits and raised concerns about safety (Rai, 2004; Prasad & Raj, 2006), and American ginseng (Panax quinquefolius) which experienced high prices followed by a market crash due to oversupply at the time of poor economic conditions of importer countries (Robbins, 2000). Rural traders often suffer the consequences of price fluctuations which have significant effects on household incomes thus undermining rural livelihoods (Sills et al., 2011). The "transaction costs" to adjust to boom and bust cycles is especially high for rural farmers who invest time and resources into cultivating NTFPs.

6.2.4 Wild collection versus cultivation

The many obstacles that impede cultivation and past failed attempts have re-established the value of wild buchu as a natural resource available to the communities of Algeria and Elandskloof. Although controlled by the community governing committee, in the case of Algeria, and by the government administrator, in the case of Elandskloof, community members have direct and equal access to a valuable resource through a secure communal land tenure system. Buchu harvesting is open to the whole community, requires less management than cultivation and does not have a high investment risk attached to it.

This study has revealed that harvesting buchu provides financial benefits, especially for the poorest households afflicted with high employment. Although income from harvesting buchu is seasonal, modest and has varied over the years, it provides cash at an especially critical time of the year to households with limited income. In congruence with other studies in South

Africa and elsewhere, income earned from harvesting buchu will by no means lift harvesters out of poverty (Shackleton, 2005; Shackleton et. al., 2011; Van Niekerk & Wynberg, 2012). It does, however, provide temporary relief from financial hardship or unemployment to harvesters (Shackleton & Shackleton, 2004; Marshall et al., 2006). As a supplementary income that forms a part of the diverse livelihood strategies that harvesters employ, buchu also plays an important role in reducing livelihood vulnerability (Ellis, 2000). These findings are supported by Williams (2005) who reported that buchu was perceived as an important source of household income to Elandsklowers. A recent survey done in Algeria revealed that the importance of buchu as a natural resource and as a source of income is not pronounced amongst households but that residents with insecure employment still regarded it as a helpful cash injection (Wilson, 2015).

Apart from its financial importance, collecting buchu from the wild is culturally valuable to the communities of Algeria and, more so, Elandskloof as the harvesting of buchu has been an integral part of community heritage for decades (Williams, 2005). It became apparent during interviews that both Algeria and Elandskloof harvesters take pleasure and pride in harvesting buchu as it requires a specific "know-how" and good knowledge of the surrounding environment, knowledge that has been passed on from older generations. Non-monetary benefits of partaking in the trade of NTFPs such as the preservation of tradition often go unnoticed but are well recognized as having high cultural value (Cocks et al., 2011)

6.3 CULTIVATION AS A CONSERVATION STRATEGY

Cultivation is widely viewed as a necessary tactic to ensure the conservation of plant species, specifically those threatened by increasing market demand (CBD, 2002; Rao et al., 2004). The main hypothesis behind domestication models as an *ex situ* conservation strategy is that they will reduce harvesting pressure on natural growing populations.

The case of buchu, however, shows that the situation is rarely that simple in reality and that many factors can undermine the conservation objective. First, the harvesting communities of Elandskloof and Algeria view the cultivation of buchu as a way to allow for annual production of buchu as well as a means to generate higher incomes every other year alongside wild collected buchu. Thus, cultivation does not necessarily replace wild collection but merely supplements it, negating its role in the conservation of a plant species. Wiersum et

al., (2006) also noted that cultivation of medicinal plants is likely to occur alongside wild harvesting in the Eastern Cape of South Africa thus not offsetting the harvesting pressures as intended.

Second, while commercial buchu cultivation has decreased the wild collection of the plant, reduced harvesting pressure cannot be solely attributed to cultivation. This is because efforts to establish buchu as a cultivated crop coincided with a drop in buchu's price which was the main reason that populations were being exploited. The significant decline in buchu's price removed the economic incentive to harvest wild populations which offset harvesting pressure experienced by wild buchu. Furthermore, a rise in price is likely to stimulate wild harvesting again which will undermine the supposed conservation results achieved by cultivation.

Lastly, cultivation is not without environmental impacts. Although no statistics are available, it is fairly safe to assume that destruction of natural vegetation such as fynbos and heavily threatened renosterveld has occurred to establish buchu plantations on previously uncultivated soil. This has been the case for rooibos cultivation in the Western Cape which, like buchu, has been promoted as opposed to the wild collection of the plant and has resulted in extensive habitat transformation (Raimondo & von Staden, 2009). Despite laws that require farmers to apply for land-use permits and to undertake Environmental Impact Assessments (EIAs), monitoring whether private land owners abide by these regulations is close to impossible. Infringement of regulations is often not deliberate but stems from farmers' ignorance of laws and their obligations (Giliomee, 2006). Cases of illegal ploughing may especially occur when small pieces of land are involved such as the expansion of existing cultivated buchu fields. On reflection, the encouragement of large-scale cultivation in the biodiverse and already sensitive area of the CFR seems like a questionable conservation strategy. This in part can be explained by the involvement of the ARC whose primary mandate of developing the agricultural sector may overlook broader environmental implications (ARC 2014).

Strict bans on harvesting or alternative conservation measures such as cultivation or are often employed due to the pervasive view that the wild collection of a species is inherently destructive (Shackleton et al., 2015a). However, if the biological and ecological traits of the affected species allows for sustainable harvesting, the local context is understood and the system is adaptively managed the wild collection of a species need not necessarily result in detrimental impacts (Shackleton et al., 2015a). Indeed, some have highlighted that the *in situ*

conservation of plant species through the implementation of sustainable harvesting regimes remains the best conservation option for valuable plant species particularly because it maintains the incentive to conserve wild populations as opposed to employing more destructive land-use practices (Homma, 1996; Schippmann, 2006). Buchu, being endemic to the Western Cape, is restricted to a narrow geographical range and only grows in localised ecological niches which make it highly susceptible to being overharvested (Schippmann et al., 2006). However, the non-destructive harvesting method where only the top branches are removed indicates that sustainable harvesting is achievable should the appropriate management regimes be employed (de Ponte Machado, 2003).

The main factor that inhibited the sustainable harvesting of buchu in the past was the high demand and resulting high economic value of the plant which encouraged irresponsible harvesting practices and mass poaching (de Ponte Machado, 2003; Coetzee, 2004). This contradicts the notion that attaching value to a natural resource will warrant its protection through sustainable harvesting practices and instead echoes the concern that market pressure can promote the over-exploitation of the resource (Arnold & Perez, 2001; Belcher, 2005). The remoteness of many harvesting areas and the fact that large populations grow on privately owned land exacerbated difficulties associated with the monitoring of harvesting and the regulation of adherence to the harvesting permit system.

In the light of the above, cultivation appears to have been a necessary step to safeguard wild populations against extinction and that it ultimately contributed to reduced harvesting pressures, playing a role in buchu conservation. However, buchu remains subjected to market conditions and, thus, whether cultivation is a worthwhile conservation strategy for a plant with high market value such as buchu remains to be seen. The case of buchu reiterates that the best management regimes to ensure ecologically sustainability remains context and species specific and requires the incorporation of adaptive approaches that can deal with the dynamic and complex nature of NTFP trade (Shackleton et al., 2011b).

6.4 THE BUCHU PRODUCTION CYCLE

Chapter 2 introduced the economic model of Homma (1992) which demonstrates the dynamics between the wild extraction and cultivation of forest products. According to the model, NTFP extraction is ultimately replaced by the domestication of the wild resource or

the development of alternatives due to the imbalances between supply and demand caused by a limited resource base. The model describes four phases of the NTFP production cycle, 1) the expansion phase, 2) the stabilisation phase, 3) the decline phase and the 4) the cultivation phase. Testing Homma's model using buchu as a case study is a difficult task. This is due firstly, to the plant's complicated and long commercialisation history across different and markets and, secondly, because of the lack of information about the exact volumes of production throughout the decades. However, this study has revealed that there have been distinct changes in the nature and scale of production in buchu's contemporary history which makes some analysis possible. Buchu's value has undergone great fluctuations and recent trade has experienced two distinct "boom and bust" phases, brought on by key market-related events. The buchu production cycle is depicted in Figure 6 which is based on informed extrapolations and not exact volumes traded.



Figure 6: Buchu production cycle

At first, buchu was exclusively extracted from the wild as a limited but steady supply was able to meet the demand of a small market. At the start of the 20th century, roughly a century after buchu first appeared on the formal market, first attempts at domesticating the plant were prompted out of expanding interest in the product. Cultivation efforts were then intensified in the mid-1900s in response to growing demand brought about by the opening of the essential

oil market after World War II. Whether or not cultivation was related to resource availability, in accordance with Homma's model, is not clear, as information about dwindling stocks are not present in the consulted archival records. However, high prices recorded for both cultivated and wild material (van Tonder, 1976) is an indicator of rarity which points to a struggling resource base. It appears, however, that cultivation was mostly stimulated by the potentially profitable commercial opportunity it presented to famers (Van Tonder, 1976). The use of newly developed synthetic sources in the 1970s, however, presented an economically more feasible alternative to both cultivation and wild extraction. As a result, in congruence with Homma's (1992) model, further cultivation of the plant was halted, wild extraction declined and alternative products replaced buchu in the flavour and fragrance markets.

The cycle repeated itself in the late 1990s, after the essential oil market re-opened, this time establishing buchu as a commercial crop. As predicted by Homma (1992), the large-scale cultivation of buchu was prompted by a declining resource base which was unable to keep up with market demand which led to efforts by industry to cultivate the plant to better control supply and decrease production costs. This was assisted by the high price of buchu which made it profitable to cultivate despite the large investment of capital required. According to Homma (1992), the economic feasibility of cultivation is the determining factor in whether a species is brought into a cultivated system if domestication is technically possible. While the recent efforts to cultivate the plant followed the model of Homma (1992), findings suggest that cultivation was escalated by private sector interest to capitalise on buchu's lucrative status as a cash crop. Conservation concerns also played a major role in the cultivation process as dwindling wild stocks stimulated the cultivation initiatives discussed in preceding chapters.

In line with Homma's predictions, as the cultivation of buchu proceeded, the predicted price drop occurred evidenced by the market crash of 2007/2008. However, the study has shown that other internal and external factors such as the IFEAT conference in 2006 and the global financial crisis of 2007/2008 were at play which impacted greatly on market value and therefore the increased cultivation of buchu cannot solely be ascribed to the drastic drop in price. The reasons for the crash of the market can also be ascribed to poor regulation of a divisive industry as, apart from the implemented permitting system, the buchu trade remained largely unregulated until the implementation of BABS regulations in 2008. What the market crashes do reveal, however, is that that the commercialisation of NTFPs remains a risky

strategy for reaching the dual objectives of conservation and rural development due to its reliance on market trends which renders them unstable.

Buchu is presently situated within the last phase of cultivation as domesticated sources have largely replaced wild collection due to it being the less costly production system of the two, confirming Homma's predicted outcome. This has, however, taken close to a century to occur with a more complicated relationship between harvesting and cultivation than the picture painted by Homma. Also, some wild harvesting is still happening, albeit very limited. The production cycle analysis has revealed that cultivation is not driven solely by producers to better control supply but that the economic incentive of high profits is a major accompanying stimulus.

CHAPTER 7: CONCLUSION & RECOMMENDATIONS

The main aim of this research was to investigate the commercial trade of buchu with a focus on the role of cultivation in commercialisation outcomes. The study has revealed that the local buchu industry is small, consisting of a handful of processing companies and producers which include two harvesting communities that are actively involved in the trade. The recent large-scale expansion of buchu cultivation in parts of the Western Cape has established buchu as a commercial crop. Cultivation has been collectively driven by government, industry, including commercial farmers, nature conservation authorities and research institutions in response to high commercial value and market demand which prompted the overexploitation of the plant in the wild.

This research has shown that buchu cultivation has impacted on the entire local industry, private land owners, local communities, and the conservation of the two commercial species. First, the cultivation of buchu contributed to two recent market crashes resulting in obvious economic implications for the local trade and all actors involved. Second, cultivation has almost entirely replaced the wild collection of the plant which has diminished harvesters' role as primary producers of buchu and represents a possible threat to their livelihood. Despite its low income earning potential and seasonal nature, harvesting buchu generates much needed cash at an important time of the year for the poorest members of communities and, thus, its importance to rural livelihoods should not be underestimated. Furthermore, low levels of capacity and a lack of appropriate land for cultivation provides little opportunity for the rural poor to engage in cultivation. Failed attempts at involving communities in the cultivation of buchu in the past have seen commercial farmers and processing companies fulfilling the role as primary producers of the buchu supply chain and acquiring the associated commercial benefits. Moreover, a look at the policy and market environment showed that while the legal provisions for access and benefit-sharing manage to protect the rights of historical and "original" traditional knowledge-holder communities who have secured a portion of these benefits, rural communities who are directly involved in the trade, who also hold traditional knowledge of buchu and who can be considered the current "custodians" of buchu have not benefitted from formal agreements.

Lastly, increased commercial cultivation has had positive conservation outcomes as the availability of cultivated buchu has significantly reduced the extent to which wild populations

are harvested. This study thus concludes that cultivation can be effective in supporting the conservation and sustainable utilisation of a threatened plant resource, but it should not be considered a panacea solution as wild populations remain subject to market forces which could stimulate over-harvesting with increased demand and accompanying high prices. Furthermore cultivation is not without environmental impacts as it results in the removal of vegetation and the destruction of natural habitat.

In conclusion, exploring the contemporary history of buchu harvesting and buchu cultivation revealed that the commercialisation of buchu has progressed along the lines of Homma's (1992) predictions and that market factors have been the determining factor in the interplay between wild collection and cultivation and the environmental and socio-economic implications stemming from this relationship. The outcomes of this research suggest that market uncertainty is a key drawback of the commercialisation of NTFPs as a simultaneous tool for development and biodiversity conservation. Changes in product prices due to market dynamics render NTFP commercialisation an unstable and risky option unlikely to result in sustainable solutions. This is especially true for cultivation as a commercialisation strategy which requires a substantial investment of resources but low certainty of potential outcomes.

In consideration of the main findings of this study, the following recommendations are made towards a sustainable buchu industry:

- Consideration should be given by all actors involved in the trade to the establishment of a buchu council to allow for better co-ordination, communication and transparency within the industry and to foster sustainable practices in the production and sale of buchu. Such a council could serve as a platform for information dissemination, research and market development, the promotion of responsible cultivation and agreements on benefit sharing.
- 2. Rigorous implementation and enforcement of harvesting, cultivation and export permits is required by CapeNature to stifle illegal harvesting and clearing of land. Furthermore, strict monitoring of market trends and price trajectories is necessary to develop preemptive policies and management plans to ensure that wild buchu populations are protected against potential future price climbs.

3. Lastly, a concerted effort should be made by the Department of Environmental Affairs (DEA) to increase awareness about national BABS legislation and the associated responsibilities of industry. Moreover, it is crucial that attempts are made to ensure that all traditional knowledge owners, including harvesting communities, are included into the negotiations of benefit-sharing agreements as key stakeholders of the buchu trade.

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APPENDIX 1: LIST OF INTERVIEWEES

RESPONDENT	AFFILIATION
Industry representatives	
Gideon Malherbe	Afriplex, Paarl
Lindsey Vye	Chicken Essentials, Citrusdal
John Rycroft	Grassroots Natural Products, Gouda
Paul Hartwig	Skimmelberg Oils/Cape Kingdom nutraceuticals,
	Bloubergstrand
Michelle Starke	Piquetbuchu, Piketberg
Benjamin Godfrey	Waterfall Healthfarm, Klein Drakenstein (Paarl)
Mannetjies Le Roux	Skimmelberg Oils
Commercial farmers	
Johannes Slabbert	Skimmelberg, Clanwilliam
Allen Harris	Buchumoon. Wellington
Willem Grobbelaar	Klein Drakenstein (Paarl)
Roelof Joubert	Klein Drakenstein (Paarl)
Johan Bruwer	Piketberg
Rural farmers	
Bernard Ockhuis	Heuningvlei
Gert Theron	Heuningvlei
Maria Swarts	Genadenberg
Ingrid Joubert	Genadenberg
Oerson Januarie	Elandskloof, former committee head
Harvesters	
Dawid Goeieman	Flandskloof
Marta Goeieman	Flandskloof
Hilton George	Flandskloof
Carlo Dirks	Flandskloof
Ruffino Adams	Flandskloof
Iohn Ianuarie	Elandskloof
John Junuarie	
Petrus Hanekom	Algeria
James Joubert	Algeria
Willem Pedro	Algeria
Jacques Van Rooi	Algeria, committee member
Donovan Saal	Algeria
Deon Joubert	Algeria
Key informants	
Patrick Lane	CapeNature, Manager of Cederberg Wilderness Area
Lacticia Tshitwamulomoni	National Department of Environmental Affairs, PTA

APPENDIX 2: INTERVIEW QUESTIONS

BUCHU HARVESTERS

- 1. Can you tell me more about yourself How/Why did you get involved with the harvesting of buchu? For how long have you been harvesting buchu?
- 2. What other type of work do you do to earn an income?
- 3. Did your parents also harvest buchu? Het hulle buchu gebruik? Vir wat?
- 4. Do you use buchu in your home if yes, for what?
- 5. Who owns the land on which you harvest?
- 6. How is it determined who in the community is allowed to harvest the communally owned buchu?
- 7. When during the year do you harvest the buchu?
- 8. What amount of buchu do you harvest per year?
- 9. What type of permits do you need to harvest the buchu?
- 10. How are the permit conditions regulated?
- 11. Have you noticed any changes in the quality or quantity of the buchu since you started harvesting?
- 12. Do you believe that buchu is under threat in the wild?
- 13. To whom do you sell the harvested buchu?
- 14. For what price do you sell the buchu?
- 15. How is the price calculated? Are you able to negotiate the price or is there a community institution that decides on who to sell to and at what price that negotiates on behalf of all harvesters?
- 16. How is the money earned from harvesting distributed among the harvesters?
- 17. Do you think this is a good arrangement?
- 18. Have there been any changes in the price since you've started selling?
- 19. How much money do you earn each year from selling buchu?
- 20. Is that your only source of income?
- 21. How much of a contribution does the income from buchu sales contribute to your overall income is it >/< 50%, 80% or 20%?
- 22. What do you use the income from buchu sales for?
- 23. Do you know the final product of the buchu you sell?
- 24. Does this product use traditional knowledge of your forefathers? (2) If yes, how. (3) How does the community benefit from the use of this knowledge?
- 25. Do you think the community should be compensated in some way or another?
- 26. Is buchu also cultivated? Where?
- 27. Why do you think buchu is being cultivated?
- 28. Is it a good or bad thing that buchu is cultivated? Please explain your answer.
- 29. Do you think wild harvested buchu is of better quality than cultivated buchu?
- 30. Would you be interested in cultivating buchu? Why or Why not?
- 31. What are your biggest worries/problems as a harvester?
- 32. What do you think are the biggest challenges faced by the community about buchu?
- 33. What are your future predictions for buchu as a plant and product?
- 34. Would you like your children to be harvesting buchu like you do?

RURAL FARMERS

- 1. Can you tell me more about yourself How/Why you got involved with buchu cultivation? For how long have you been cultivating buchu?
- 2. What other type of work do you do to earn an income?
- 3. Who owns the land on which you cultivate?
- 4. Do you need a permit to cultivate?
- 5. How big is the cultivated area?
- 6. What was the previous state of now cultivated land? Was it farmed for something else or was it wild?
- 7. Where do you get your seed or seedlings from?
- 8. Can you tell me more about the costs of inputs; seeds, technical equipment, labour, water, lease of

land?

- 9. How much water is required?
- 10. Do you make use of any fertilizer/herbicide/pesticide?
- 11. Where did you get the knowledge or technical advice about growing buchu?
- 12. What are the biggest practical challenges of buchu cultivation?
- 13. When during the year do you plant the buchu? When do you harvest?
- 14. What amount of buchu do you plant and harvest a year? Do you harvest it all at once?
- 15. How many labourers do you employ to look after the cultivated buchu?
- 16. Do you believe that buchu is under threat in the wild?
- 17. Do you process or distil your own buchu? If not, why not?
- 18. Would you be interested in processing /distilling your own buchu?
- 19. To whom do you sell your buchu?
- 20. For what amount do you sell the buchu?
- 21. How is the price determined?
- 22. Are you able to negotiate the price?
- 23. Is there a community institutions / co-ops that help you to find buyers, negotiate prices?
- 24. Have there been any changes in the price since you've started selling?
- 25. How do you ensure your buchu has the quality the buyers want?
- 26. Do they prefer cultivated buchu to wild buchu?
- 27. How much money do you earn each year from selling buchu?
- 28. Is it your only source of income?
- 29. How much of a contribution does the income from buchu sales contribute to your overall income is it >/< than 50%, 80% or 20%?
- 30. What do you use the income from buchu sales for?
- 31. Do you know the final product of the buchu sold?
- 32. In your opinion, does this product use traditional knowledge of your forefathers? (2) If yes, how.(3) How does the community benefit from the use of this knowledge?
- 33. Do you think they should be compensated in some way or another?
- 34. Do you use buchu in your home for what?
- 35. What are your biggest worries as a farmer?
- 36. What do you think are the biggest challenges faced by the buchu industry as a whole?
- 37. What are your future predictions for buchu?
- 38. Would you like your children to cultivate buchu too?

COMMERCIAL FARMERS

- 1. Can you tell me about yourself and your farm? How you are involved with buchu?
- 2. For how long have you been cultivating buchu?
- 3. Why did you start cultivating buchu?
- 4. What type of inputs are required for buchu cultivation? What are the costs of these inputs?
- 5. What are the biggest practical challenges of cultivating buchu?
- 6. Can you highlight any significant highpoints/lowpoints since you've been involved in the buchu trade?
- 7. How is the growing and buying and selling buchu regulated?
- 8. Is the lack of regulation worrying to you?
- 9. Who owns the land on which you cultivate?
- 10. How big is the cultivated area?
- 11. What was the previous state of now cultivated land?
- 12. How much water does the buchu require?
- 13. Do you make use of any fertilizer/herbicide/pesticide?
- 14. When during the year do you plant and harvest the buchu?
- 15. What amount of buchu do you plant and harvest a year?
- 16. How many labourers do you employ to attend to the buchu?
- 17. Do you also harvest wild buchu? On who's land? How is it regulated?
- 18. Do you implement any measures to ensure that harvesting is sustainable?
- 19. Did you harvest in the past? Why did you stop?

- 20. Do you believe that buchu is under threat in the wild? Why?
- 21. Do you process or distil your own buchu?
 - NO
- 22. Why not?
- 23. Would you be interested in processing/distilling your own buchu?
- 24. To whom do you sell the buchu? Seed/seedlings/leaf?
- 25. For what is it used?
- 26. How much buchu do you sell per year?
- 27. Is there a difference in the demand for cultivated buchu versus wild buchu? If yes, why? What are the differences between the two?
- 28. At what price is buchu sold?

YES

- 29. How much buchu do you process/distill a year?
- 30. What is the volume ratio of buchu to buchu oil/tea?
- 31. Is there a difference in the demand for oil from cultivated buchu versus wild buchu? If yes, why? What are the differences between the two?
- 32. To whom do you sell the oil/tea?
- 33. For what is the oil used?
- 34. At what price is buchu/tea oil sold?

CONTINUED

- 35. How is the price determined? Are you able to negotiate the price?
- 36. Have there been any significant changes in the market since you've been involved in the industry?
- 37. Is the income from buchu sales your only source of income?
- 38. How much of a contribution does the income from buchu sales contribute to your overall income?
- 39. How much profit do you make a year from buchu? What is the profit margin?
- 40. In your opinion, are buchu products based on traditional knowledge?
- 41. If yes, how do you think owners of this knowledge best be compensated?
- 42. Are you required by law to enter with benefit-sharing agreements with these knowledge holders?
- 43. If yes, how are you going about doing this?
- 44. What are your biggest worries/challenges as a farmer?
- 45. What do you think are the biggest challenges faced by the buchu industry as a whole?
- 46. What are your future predictions for buchu?
- 47. Do you see yourself expanding your farm?

BUCHU PROCESSORS/DISTILLERS (without cultivated fields)

- 1. Where do you buy your raw material from?
- 2. How much buchu do you distill a year?
- 3. What is the volume ratio of buchu to buchu oil?
- 4. Is there a difference in the demand for cultivated buchu versus wild buchu? If yes, why? What are the differences between the two?
- 5. Do you believe that buchu is under threat in the wild? Why/Why not?
- 6. Would you be interested in cultivating your own buchu? Why/Why not?
- 7. To whom do you sell the oil?
- 8. At what price is buchu oil sold?
- 9. For what is the oil used?
- 10. In your opinion, are buchu products based on traditional knowledge?
- 11. If yes, how should the owners of this knowledge best be compensated?
- 12. Are you required by law to enter into benefit-sharing agreements with these knowledge holders?
- 13. If yes, how are you going about this?
- 14. What regulations are in place regarding the trade of buchu?
- 15. What are the biggest challenges of the legal environment?
- 16. What are your biggest concerns/challenges as a distiller?
- 17. What do you think are the biggest challenges faced by the buchu industry as a whole presently?

18 .What are your future predictions for buchu?

CAPENATURE

- 1. What is your role here at CapeNature?
- 2. How long have you been working for CapeNature?
- 3. How are you involved with the conservation of buchu?
- 4. Is buchu a listed threatened and protected species under NEMBA?
- 5. Under what class is buchu? (protected, vulnerable, endangered, critically endangered?)
- 6. How is the trade and cultivation of buchu regulated?
- 7. Can you tell me more about the permit system for harvesting buchu:
 - a. Who all must apply for a permit?
 - b. How do you go about getting a permit?
 - c. How long is the permit valid?
 - d. How many permits are issued a year?
 - e. What are the conditions of the permit?
 - f. How is it regulated whether these conditions are adhered to?
- 8. Are permit-holders adhering to the conditions of permits?
- 9. Is poaching a problem presently?
- 10. Has poaching been a problem in the past?
- 11. What measures do CapeNature employ to address poaching?
- 12. What is your level of concern for the sustainability of the plant in the wild presently?
- 13. Has buchu been under threat in the past? When? Why?
- 14. What measures did CapeNature employ to address the decline in buchu numbers?
- 15. Does CapeNature view the cultivation of buchu as a strategy for conservation?
- 16. Is CapeNature involved with the cultivation of buchu presently?
 - a. If yes, can you please elaborate?

(When was the project initiated? Who is involved? What inputs were required? Who supplied financial and technical assistance? What have been the major challenges of the project? What are the future objectives of the project?)

b. If no, has CapeNature been involved in the cultivation of buchu in the past?*i.* If yes, can you please elaborate

(When was the project initiated? Who is involved? What inputs were required? Who supplied financial and technical assistance?)

- ii. Why was the project suspended?
- 17. **If no,** would cultivation of buchu be a possible future undertaking for CapeNature? Why/Why not?
- 18. Have there been any population/distribution studies on buchu recently? If, yes what have the results shown?
- 19. What are your future predictions for buchu?

DEPARTMENT OF ENVIRONMENTAL AFFAIRS

- 1. What is your role at DEA
 - 1.1 Have you personally dealt with buchu specifically?
- 2. How does DEA regulate the use and trade of buchu/indigenous plants?
 - 2.1 How does the permitting system work
 - Bioprospecting permits Who all is considered as a bioprospector?
 - What are the costs involved?
 - For how long is the permit valid?
 - Do cultivators need to apply for permits?
 - How is harvesting regulated?
- 3. Are you aware of any illegal harvesting?
 - 3.1 Are you aware of any prosecutions following illegal harvesting?
- 4. Is there any concern for the sustainability of the resource presently?
- 5. Who is considered as the original knowledge-holders of the value of buchu?
 - 5.1 How was this determined?

- What progress has been made with the issuing of permits and the implementation of benefit-6. sharing agreements for buchu?
 - Are benefit-sharing agreements based on a percentage of profits? _
 - How is the money distributed to relevant parties? _
 - Is the Bioprospecting fund operational currently? _
- 7. How are cases where people are operating without a permit being addressed
- 8. What have been the major obstacles faced with implementing these regulations for buchu?9. What are the department's main concerns relating to the buchu industry?
- 10. Does DEA view trade in buchu as a positive contribution towards the alleviation of poverty?
- 11. How does the government view the future of the trade in buchu?