IMPLEMENTING CONSERVATION IN THE CEDERBERG MOUNTAIN RANGE:

THE ROLE OF THE BUCHU *(Agathosma Betulina)* SECTOR

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Table of Contents

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Abstract

Through the early 2000s, the expanded popularity of the fynbos buchu shrubs (*Agathosma betulina and Agathosma crenulata*) for its use in medicinal products and as an essential oil drove demand to a point where wild stocks of the species became threatened by poor management practices and over-harvesting. In response, cultivation was encouraged to augment species supplies. The impact the continued expansion of commercialisation has had on the species and its wider landscape, however, remains unknown. As a member of the fynbos family of plants, buchu is an aromatic shrub endemic to the biodiversity-rich Cape Floristic Region (CFR) found predominantly in the Western Cape, South Africa.

The study aimed to contribute to a better understanding of the role actors within the buchu sector economy play in either mitigating or exacerbating threats to buchu and surrounding vegetation. Further, the study looked to determine if the activities associated with wild buchu harvesting and the expansion of monoculture buchu plantations threaten biodiversity and the interconnectedness of species within the greater fynbos habitat. To meet this aim, the study utilised a qualitative methods approach and involved semi-structured interviews with buchu producers, users, and processors across the Cederberg Municipality and with regulators operating across the Western Cape Province.

The research found that the regulations and laws applying to the South African context are well positioned to effectively protect indigenous plants such as buchu, while monitoring and implementation remains challenging due to landscape and resource constraints. All buchu value chain participants provided a general understanding and accurate interpretation of the concepts of biodiversity conservation. Furthermore, participants acknowledged that the protection of biodiversity was essential to sustaining the operations and functioning of the industry itself. All domestic participants expressed a personal connection to buchu as a species and a protectionist attitude towards its existence across both the wild and cultivated environments. Value chain participants involved in farming, wild harvesting, and processing saw themselves as contributors to conservation efforts aimed at protecting the species and mitigating threats, while those further afield believed conservation should be prioritised and implemented by national or provincial management authorities. The study concludes that due to many steps of the value chain occurring within the immediate environment where the plant grows, those involved in commercialisation of

the species are well positioned to become active participants in a cross-disciplinary approach to conservation implementation and biodiversity management efforts at local and regional levels and could be recommended to advise on management priorities affecting buchu and the associated landscapes as key informants, as well as to assist authorities with the implementation of associated activities.

List of Abbreviations

ABS	Access and Benefit Sharing
BABS	Bioprospecting, Access, and Benefit Sharing
BMP	Biodiversity Management Plan
CBC	Community-Based Conservation
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resource Management
CFR	Cape Floristic Region
COP	Conference of Parties
CSIR	Council for Scientific and Industrial Research
DA	Department of Agriculture
DEADP	Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries, and the Environment
ECPA	Elandskloof Communal Property Association
EIA	Environmental Impact Assessment
GR	Genetic Resources
IBR	Indigenous Biological Resources
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NGO	Non-Governmental Organisation
NKSC	The National Khoi-San Council
NTFP	Non-Timber Forest Product
SAAFFI	South African Association of the Flavour and Fragrance Industry
SAEOPA	South African Essential Oil Producers Association
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SASC	South African San Council
SDP	Sector Development Plan
TK	Traditional Knowledge
TOPS	Threatened or Protected Species
UN	United Nations

Chapter 1: INTRODUCTION

1.1 Background

Buchu (*Agathosma* spp.) is a rutaceous shrub that forms part of the fynbos vegetation endemic to the Cape Floristic Region (CFR) of the southwest region of Africa (Moolla and Viljoen, 2009, Manning and Goldblatt, 2012, Privett et al., 2020). The heart of the CFR, defined by Manning et al. (2012) as the portion of the region comprised of mostly fynbos vegetation, spans 90 760 km^2 and contains an estimated 9 383 species of plants, 9 251 of which are flowering species (Manning and Goldblatt, 2012). It is unusual to find such biological diversity (biodiversity) and such a predominance of perennial flowering species in a region that is classified as semi-arid (Manning and Goldblatt, 2012). Buchu is found growing naturally at high altitudes across the Winterhoek and Outeniqua Mountain ranges, mostly within the Western Cape Province. The cultivation of buchu has only been successful on high-altitude plantations located in regions where buchu is found growing in nature.

Buchu falls into a category of genetic resources (GR) termed non-timber forest products (NTFPs). The term NTFP initially depicted naturally occurring GR (other than timber) that grew within a forest that had an already established market, or the potential for one to be developed (Belcher and Schreckenberg, 2007). NTFPs were promoted to encourage communities to harvest products other than timber, thereby helping maintain the overall forested ecosystem, while earning incomes to support their livelihoods (Belcher and Schreckenberg, 2007). As such, the commercialisation of NTFPs has been an approach used by governments and individuals around the world to simultaneously satisfy both livelihoods and conservation agendas (Arnold and Ruiz Perez, 2001). By establishing a market value for a NTFP, local communities seek to benefit through supplemental income generated through harvesting and production activities (Belcher and Schreckenberg, 2007). Encouraging the sustainable use of NTFPs ensures not only the future of the sector, but also promotes the establishment of best practices that can benefit associated ecosystems.

Products containing buchu have been developed into a well-established market. Buchu has been used for hundreds of years for its aromatic and healing properties by Indigenous peoples of Southern Africa. Distilling the leaves of the buchu plant produces an aromatic oil and flavourant which is then used as an antiseptic and anti-inflammatory agent, and to treat urinary, kidney and digestive problems (Ingram, 2014, Liz-Balchin et al., 2001, Low, 2007, Skosana et al., 2014, Sandasi et al., 2023). European travellers to the Cape region of South Africa first documented its use amongst

Indigenous peoples more than 350 years ago (Low, 2007). Throughout the centuries, the demand for buchu has grown both locally, and internationally, as pharmacological, and agricultural companies marketed the product at a larger scale. This increased interest in the shrub created a demand beyond what could be met through harvesting of wild growing plants. Cultivated plantations were first established in the 1800s in regions where buchu was found to be able to meet the growing demand and to provide a more consistent supply of raw materials for the products industry.

Presently, buchu for the commercial market is supplied by a combination of plants provided by wild harvesting and cultivation activities. The success of the market depends on a relatively stable supply, while threats affecting the variability in supply derive from both natural and anthropogenic sources. Examples of natural threats include naturally occurring fire, pests, and disease. Anthropogenic threats to buchu include increased fire activity caused by human activity, including agricultural and human encroachment into wild areas causing land transformation and unsustainable harvesting practices. Examples of harvesting practices that threaten buchu include the removal of plant roots, poaching of plants from protected areas, removal of plants from privately-owned land without proper permitting, over-harvesting, and harvesting at the wrong time of the year. While buchu harvesting (both wild and cultivated), trade, and transport are subject to control through a permitting process, enforcement remains challenging (van Deventer et al., 2016) as cultivated plantations are situated in remote valleys and adjacent to protected land. Furthermore, conversion of virgin fynbos landscapes to promote monoculture cultivation continues to pose a major threat to the biodiversity and functioning of habitats within the CFR (Rouget et al., 2003).

1.2 Aim and Objectives

The main aim of the study is to contribute to the understanding of the role that the buchu sector plays in sustainable use of the species and conservation of surrounding habitats. The study explores the perceptions of conservation and sustainable use held by buchu value chain participants and the environmental impacts of sector-driven activities, including wild harvesting and cultivation.

The objectives of the project are to:

- investigate the current status of the conservation-based regulatory framework that affects the buchu sector

- determine how different actors in the buchu value chain perceive and participate in conservation and sustainable use activities
- tailor a set of recommendations to strengthen the implementation of conservation in the buchu sector

1.3 Methods

The project used a qualitative research methodology approach. First, a literature review was conducted pertaining to the current state of conservation globally, while national and local conservation strategies affecting participants within the buchu value chain were explored. These results were then integrated into first-hand data collection consisting of semi-structured interviews conducted with members from the buchu value chain, including providers, users, and regulators. Finally, transect walks were conducted through both wild harvested and cultivated landscapes in the Cederberg Municipality, and Elandskloof Village, the Western Cape Province, South Africa. Walks were accompanied by buchu farmers and processors and provided essential insights into the geographical distribution and land composition of the area in which buchu is grown and processed.

1.4 Rationale for Research

The rationale for the study comes from an acknowledgment that despite the recognition by governments of the importance of maintaining biological diversity, as evidenced 30 years ago by adoption of the Convention on Biological Diversity (CBD), human-driven habitat and species loss continues at an unprecedented pace. Critics indicate that implementation of the CBD framework has been limited and that commercialisation has failed to support effective preservation and conservation. Moreover, biodiversity loss has continued despite efforts made by countries to implement the CBD in accordance with national biodiversity strategies (Prathapan and Rajan, 2011, Qin, 2021, Ulloa et al., 2018).

There is increased international and domestic demand for buchu-derived products which has put pressure on the supply from naturally occurring sources. Coupled with regulations limiting the harvesting of wild growing buchu, cultivation of the species has been promoted (Department of Agriculture Forestry and Fisheries, 2011). If regulation is implemented effectively, an augmented supply can help reduce pressure on naturally growing plants and help to preserve their associated habitats and ecosystems.

Agathosma betulina is one of the few NTFPs in Southern Africa that has been fully commercialised and boasts a consistent market demand (Van Wyk & Prinsloo, 2018, Van Wyk, 2011). Members of the buchu value chain are thus directly dependent on GR as their main input and have a vested interest in the survival of the species. A unique opportunity exists to integrate actors into promoting an ethos of sustainable use and conservation of associated habitats, which in this case is the CFK. The market itself is relatively small and localised. Only 500 tons of buchu leaf and around 1000 kg of oil are produced annually (Berliner et al., 2020, Triumph, 2004), and producers and processors are limited to two regions within the Western Cape Province. As such, this research aims to establish a deeper understanding of the role value chain actors play in conservation across the Western Cape Province. Knowledge gained through this research can be used as a first step towards guiding conservation actions within the buchu sector and can be extrapolated to other NTFP value chains.

1.5 Structure of the Dissertation

This dissertation contains seven chapters. Following this introduction*, Chapter 2: Literature Review*, provides an overview of conservation, biological diversity, and sustainable use before outlining the regulatory framework in the conservation space. An overview of the conservation management authorities and common conservation strategies is provided as well as tools used to manage conservation and sustainable use. *Chapter 3* presents the research methodology used during data collection, including an overview of the data analysis software used. The participants are profiled, and the study area is described in detail with accompanying maps. Finally, the chapter ends by providing the study's limitations and ethical considerations. *Chapter 4: The Commercialisation of Buchu*, presents the plant's ecology, use, and value chain. The role each of the actors in the chain plays in commercialisation activities is described and results from participants are integrated throughout the subsections within the chapter. *Chapter 5: Perceptions of Buchu: Conservation and Sustainable Use*, provides an insight into how value chain participants interpret these concepts and provides details on the roles actors play in the conservation of the species and the landscape. Descriptions of wild harvesting and cultivation techniques are detailed, and finally, the personal relationships value chain participants have with buchu are considered. *Chapter 6: Discussion*, analyses the role buchu chain participants play in conservation in comparison to other NTFPs. Finally, in *Chapter 7: Conclusion*, the future of the role of NTFP value chain participants can play in conservation and sustainable use efforts is considered.

Chapter 2: LITERATURE REVIEW

2.1 Biological Diversity, Conservation, and Sustainable Use

The United Nations Convention on Biological Diversity (CBD) defines biological diversity (biodiversity) as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems" (United Nations Environment Programme, 1992, p. 3).

Common methods of conservation include: establishing protected areas and habitats, regulating the use of biological resources, encouraging sustainable development by minimising and mitigating environmental impacts associated with development, controlling threats to ecosystems, promoting Indigenous and traditional knowledge (TK) relating to sustainable use, and creating effective legislation to manage activities (United Nations Environment Programme, 1992).

Across the globe, the use of wild species is widespread, providing support to economies and to billions of livelihoods through income generation, food, medicine, shelter, and energy (IPBES, 2022). This dissertation has adopted the following overarching definition of sustainable use provided by the CBD in 1992: "the use of components of biological diversity in a way and at a rate that does not lead to the long term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations" (United Nations Environment Programme, 1992, p. 4). The conservation and sustainable use of biological resources is interlinked with the continued functioning of society and its people (IPBES, 2022). In 2022, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) evaluated the sustainable use of wild species. Building upon past recent reports (including the Global Assessment Report on Biodiversity and Ecosystem Services), IPBES highlighted the impacts of human use of species on wild populations as well as the dependence of human populations, especially those with vulnerabilities, on wild species for food, medicine, energy, and income (IPBES, 2022, IPBES 2019).

The gathering of wild species from terrestrial areas for food and medicinal purposes is expanding in most cases (IPBES, 2022). This increased dependence drives up demand while simultaneously impacts from climate change threaten availability (IPBES, 2022). To further define the role humans have within the environment and in acknowledgment of the connectedness of species, researchers

Van Wyk and Prinsloo (2018) highlight that in a sustainable society there is an interdependence and balance that occurs with utilisation of genetic resources whereby either stability or improvement of both human and environmental well-being occur. The sustainable use of wild species is a crux in ensuring the mitigation of biodiversity decline while simultaneously supporting human populations (IPBES, 2022). It is through a combination of conservation and sustainable use, hereafter referred to as CSU, that responsible use of wild species or natural GR is therefore defined.

2.2 Legal and Policy Framework

This section provides an overview of the international and national laws and policies that exist to promote the conservation and sustainable use of GR and outlines regulation of the sharing and distribution of benefits arising from the commercialisation of individual species. The most successful policy tools involve a process of specification to ecological conditions with consideration of social contexts surrounding the use of wild species (IPBES, 2022). These laws and policies have been developed to protect species from over-exploitation, while recognising the expanded use and dependence on wild products for the sustenance of human life. A more detailed look at underlying factors influencing the sustainability of practices is provided by the recent IPBES (2022) global assessment of sustainable use and is adapted below in Figure 1. Factors influencing more sustainable practices are listed on the left and include participatory practices where adaptation to the local context is at the forefront of consideration of law. Less sustainable practices are those that lack consideration for the context in which they are applied and that reinforce top- down methodology with an imbalance of power.

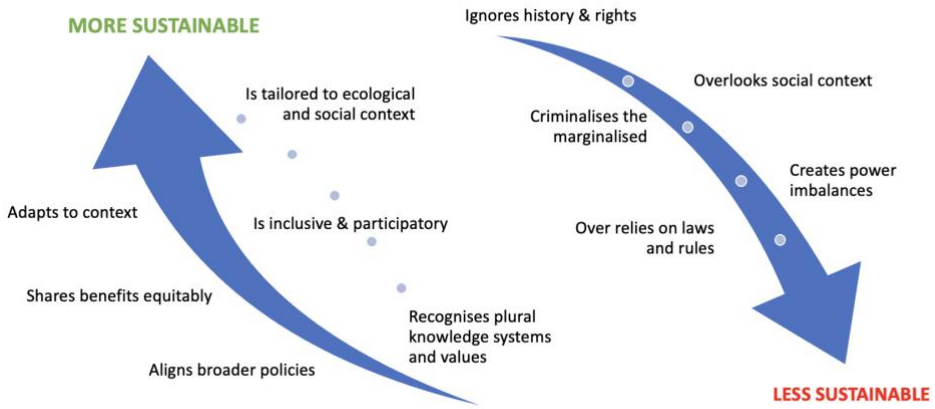

Figure 1. Conditions that enable or constrain sustainable use policies (Adapted from IPBES, 2022, p.27)

2.2.1 International Laws and Policies

2.2.1.1 The United Nations Convention on Biological Diversity (CBD)

In June 1992, the United Nations (UN) hosted the Earth Summit in Rio de Janeiro, Brazil in response to the UN's recognition of the rapid deterioration of many facets of the environment, including the continued abstraction of raw materials which was impacting biodiversity. During the summit, a multilateral environmental agreement known as the United Nations Convention on Biological Diversity (CBD) was negotiated, outlining the acknowledgment of the importance of biodiversity, its conservation, and its sustainable use. Further, the framework addressed the need for an equitable distribution of benefits arising from that use.

The objectives of the Convention include:

- Conservation of biological diversity
- Sustainable use of its components
- Fair and equitable sharing of the benefits arising out of the utilisation of genetic resources (United Nations Environment Programme, 1992)

2.2.1.2 Bioprospecting and Biotrade

The commercial use of GR is typically defined through two processes termed biological prospecting (bioprospecting) and biotrade. Bioprospecting involves the "exploration of biological material for commercially valuable genetic and biochemical properties" (Reid et al., 1993, p. 1). The initial bioprospecting process includes conducting "research on, or development or application of, GR for commercial or industrial exploitation" (Department of Environmental Affairs and Tourism, 2004, p. 14). If following a bioprospecting process, a product is deemed viable for commercialisation, a market value is established and subsequent sale of the products, or biotrade, can commence.

The regulation of the bioprospecting and biotrade process is implemented at a national level. Individual countries are responsible for creating regulatory frameworks that address how GR are managed within their individual context and how benefits are equitably shared.

2.2.1.3 The Nagoya Protocol

In 2010, the CBD Conference of the Parties (COP) was hosted in Nagoya, Japan, with a key objective to negotiate a framework guiding how the third objective of the CBD, to promote the fair and equitable sharing of benefits arising from utilisation and commercialisation of genetic biodiversity (Cusi, 2016, Morgera and Tsioumani, 2010), could be implemented. For the purpose of this dissertation the term “benefit” as related to bioprospecting involving GR is defined as “any benefit whether commercial or not, rising from bioprospecting involving Indigenous resources and includes both monetary and non-monetary returns'' (Department of Environmental Affairs and Tourism, 2004, p. 12). The result of the CBD COP was the adoption of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (hereafter, ‘the Nagoya Protocol’).

The overall aim of the Nagoya Protocol is to ensure the equitable sharing of benefits arising from the use of GR, the third aim of the CBD, and perhaps in isolating this aim, those involved in its ratification believed that a focused approach could benefit its implementation. In ensuring fair benefits, the Nagoya Protocol also aims to ensure the conservation of biodiversity and the sustainable use of its elements (Cusi, 2016). The Nagoya Protocol has thus become the cornerstone for what is termed the access and benefit sharing (ABS) agreement process. Anyone seeking to use the genetic resource or associated TK, is required, under the agreement process, to negotiate a contract with the holders of the genetic resource or TK in the country of origin of that resource. This contract stipulates how benefits arising from the use of the genetic resource or TK are distributed back to those who hold original knowledge of its use and applications. Compliance with setting up these agreements is regulated through national governments. According to the Protocol, it is understood that each participating country is independently responsible for regulating access and benefit sharing at the local/national level (Cusi, 2016). In developing countries and in under-served communities, the expectations of the valuation of natural products through the benefit sharing of their commercialisation has been touted as the economic solution to their poverty (Brockington and Wilkie, 2015). Despite some local successes, however, distribution (and redistribution) of benefits, both monetary and non-monetary, has seldom occurred (Brockington and Wilkie, 2015, Friso et al., 2020, Morgera and Tsioumani, 2010, Prathapan and Rajan, 2011). Challenges have stemmed, in some cases, from a lack of clarity about the application process for beneficiaries, while the monitoring of compliance has been underfunded and under resourced (Friso et al., 2020). Further still, critics argue that by focusing on the distribution of benefits, commercialisation of GR itself has

overshadowed elements of preservation of biodiversity preservation and the ecological and scientific value of biodiversity conservation has come second to market values derived thereof (Coolsaet et al., 2015, Prathapan and Rajan, 2011, Wynberg and Laird, 2022). As of November 2022, the Nagoya Protocol had been ratified by 138 of the 198 Parties to the CBD, while 132 had established the required 'competent national authority' to carry out new regulations to facilitate the implementation of the CBD and Nagoya Protocol (Convention on Biological Diversity, 2022, Harvey and Gericke, 2011). South Africa is a signatory to the Nagoya Protocol and has established a competent national authority.

2.2.2 National Laws and Policies

In South Africa, national laws have been established to regulate the use of GR or of Indigenous Biological Resources (IBR), including the National Environmental Management: Biodiversity Act (NEMBA) and the Bioprospecting and Access and Benefit-Sharing (BABS) regulatory framework.

2.2.2.1 The National Environmental Management: Biodiversity Act (NEMBA)

The National Environmental Management Biodiversity Act [No. 10 of 2004] (NEMBA) is the national regulatory framework established to implement the aims and objectives of the CBD and Nagoya Protocol. NEMBA was established through the country's listed Competent National Authority, the Department of Forestry, Fisheries, and the Environment (DFFE).

The objectives of NEMBA are to:

> *"provide for- the management and conservation of South Africa's biodiversity…the protection of species and ecosystems that warrant national protection; the sustainable use of Indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving Indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith" (Department of Environmental Affairs and Tourism, 2004, p. 2).*

Through the DFFE, NEMBA is used to implement the management of biodiversity on a national level. As part of NEMBA, activities that have an impact on protected and indigenous species are restricted. Some of these activities may involve species commercialisation and exploitation. Particularly, Article 83 of the act requires benefit-sharing agreements to be negotiated, with the intention to implement how benefits from the commercial use of biodiversity are distributed to communities (Department of Environmental Affairs and Tourism, 2004). Prior to the implementation of NEMBA, there was no formal monitoring of the distribution of benefits arising from the use of IBR. In some South African

communities, for example, traditional healers would take medicinal plants to the CSIR for testing and in-turn would receive compensation for their knowledge (Osseo-Asare, 2014). This system was rudimentary, however, and not formalised, resulting in challenges with the distribution of benefits making their way to individual communities (Osseo-Asare, 2014).

2.2.2.2 Bioprospecting and Access and Benefit-Sharing (BABS)

In South Africa, national law regulates the bioprospecting of resources through the implementation of the BABS regulatory framework, which includes details pertaining to when a permit is required and how benefits derived from products should be established. Once a product becomes successfully prospected and a commercial valuation is completed, the sale or trade of this product is considered biotrade. From 2016 through the end of 2021, the DFFE approved 39 Internationally Recognized Certificates of Compliance in relation to BABS as defined by NEMBA and as listed through the Access and Benefit Sharing Clearing House (United Nations Environment Programme, 2022). At the time of writing, 29 of the 39 certificates of compliance were for permits relating to plants, and of these, 27 were for commercial purposes; only two permits were for non-commercial bioprospecting research purposes (United Nations Environment Programme, 2022).

2.2.3 Regulations within the Buchu Industry

The first formalised access and benefit sharing (ABS) agreements in the buchu industry were initiated in 2013 (United Nations Environment Programme, 2022, The South African San Council, 2013). The intention of ABS agreements has been to ensure there is a no exploitation of the resource without prior consent or a compensation arrangement with those holding TK (Wynberg, 2023). In the buchu ABS agreements, the Khoikhoi and San Indigenous groups of southwestern Africa possessed the first knowledge of the use of buchu in medicinal applications and as a result are recognised as legal recipients of benefits derived from its commercialisation (The South African San Council, 2013). The agreements were initially approved for a period of approximately 5 years, at which point an application for renewal would be required. Individual agreements were made with groups said to be representative of the Khoikhoi and San. One organisation identified as a beneficiary was the Cape Bush Doctors (Kaapse Bossiedokters), a Not-for-Profit Organisation representing Indigenous healers of the Cape region claiming Khoi-San heritage (Cape Bush Doctors, 2022, Industry Representative 3).

In November 2019, the Traditional and Khoi-San Leadership Act 3 was passed by the Office of the Presidency, stating that TK holders had to be represented through registered traditional councils (Parliament of the Republic of South Africa, 2019). Through this Act, a formalised structure was established outlining the process required for the establishment and membership of a traditional council. Despite the legality of the initial ABS agreement with the Kaapse Bossiedokters, when the renewal period arrived in 2019, industry representatives were told that only two groups had satisfied the requirements to become registered beneficiaries within the buchu industry: the National Khoi-San Council (NKSC) and the South African San Council (SASC) (Industry Representative 3). While there have been existing ABS agreements in place with these two groups already (The South African San Council, 2013) the agreements had not previously been limited exclusively to them.

At that same time in 2019, ABS negotiations for the rooibos (*Aspalathus linearis*) industry were ongoing, with the legal beneficiaries also declared to be the NKSC and SASC (South African Rooibos Council, 2019). As the geographical distribution of buchu and rooibos overlaps significantly and they share many of the same producers, it is understandable that the beneficiaries for the two species would be the same.

At the time of writing in 2022, there were five approved and publicly accessible commercial ABS agreements between beneficiaries NKSC, SASC, and members of the buchu industry in South Africa (United Nations Environment Programme, 2022). Buchu industry members with current agreements include: Puris Natural Aroma Chemicals (Pty) Ltd., Parceval (Pty) Ltd., Cape Kingdom Nutraceuticals, Quintessence Collections CC, and Skimmelberg Fynbos Oils (Pty) Ltd.

2.3 Conservation Strategies

This section provides a brief overview of conservation strategies used to guide the preservation of species and to protect GR from exploitation globally.

2.3.1 In Situ and Ex Situ Conservation

In general, conservation efforts can be grouped into two main approaches: *in situ* and *ex situ*.

In situ

In situ conservation involves the protection of natural species in their naturally endemic locations and in their wild states (Chen et al., 2016). *In situ,* or 'on-site', conservation is an ecosystem-level based approach, allowing for the complete protection of the biodiversity of landscapes including communities of species and the natural symbiotic and commensal relationships that exist between them. Preservation is considered an *in situ* conservation strategy where protection of the genetic diversity of species is maintained and human interaction with these species is excluded, with complete prohibition of the extraction of species (Chen et al., 2016). Establishment of a protected area or a natural reserve is an example of an *in situ* conservation strategy. This approach promotes the maintenance of natural wild spaces ensuring habitats and a web of species with larger ecosystem functions is protected, where both known and unknown species benefit from this protection (Possiel et al., 1995).

Land use competition is such, however, that in many cases, the establishment of a nature reserve where all human activities are excluded, becomes unrealistic. An alternative means of *in situ* conservation is the establishment of conservation areas where limited or low-impact use activities are allowed using non-invasive sustainable methods and according to a quota or permitted quantity and depending on the resource's conservation status and regeneration rate. In 2017, an extensive guideline for harvesting of wild honeybush (*Cyclopia*) was published, providing users guidance according to a listed sub-species (McGregor, 2017). The harvesting methodology provided takes into consideration the unique reproduction and regrowth characteristics of *Cyclopia's* sub-species. The sub-species that are re-seeders depend on fire for their buried seeds to germinate, while those that are re-sprouters take time to recover from fire as the leaves themselves are responsible for feeding underground root systems (McGregor, 2017). Thus, harvesting of the leaves too soon after a period of growth could result in reduced survival rates. The nuanced differences between acceptable harvesting at a sub-species level illustrates the fragility of species and the need for tailored guidelines within conservation areas permitting extraction activities.

Ex situ

In cases where *in situ* conservation is not possible, *ex situ* conservation approaches can be applied in a complementary manner at the species level. In *ex situ*, or 'off-site', conservation, plant cultivation is possible for species that may be over exploited, endangered, that grow slowly, or are susceptible to disease (Chen et al., 2016, Hamilton, 2004, Havens et al., 2006). Examples of *ex situ* methods include botanic gardens, propagation nurseries, and seed banks. Offering various means by which to

protect genetic biodiversity and support endangered species at locations that might be near to a plant's endemic area. Protecting genetic biodiversity is a valuable practice in cases where wild species become threatened due to pests, parasites, natural disasters, or land use degradation. The main downfalls of *ex situ* conservation efforts are that they involve the removal of individuals from their natural habitats, which, while successful in some species, is challenging with others. Further, the cost of *ex situ* conservation efforts is generally high requiring a lot of investment both for establishment as well as for maintenance (Possiel et al., 1995)

2.4 Conservation Management

2.4.1 Recognised Management Authorities

Across the world, conservation management authorities are typically established to implement stipulations laid out in the regulatory framework and to carry out management of designated protected areas. In South Africa, there are five types of protected areas: special nature reserves, national parks, nature reserves, forest protected areas, and World Heritage sites (Department of Environmental Affairs, 2010). National, provincial, and local authorities have been established to jointly carry out biodiversity management. At the time of writing there were 14 management authorities responsible for this oversight. These included three national management department authorities (DFFE, DEADP, DA), one national management authority, the South African National Parks (SANParks), and 10 provincial and local management authorities (Department of Environmental Affairs, 2010).

2.4.1.1 Provincial Conservation Authority: CapeNature

At the provincial level across South Africa, there are conservation authorities acting as responsible parties, authorities, and chief custodians of the natural environment of that province. As the research was conducted in the Western Cape Province, the provincial authority managing buchu is CapeNature, which is governed by the Western Cape Nature Conservation Board (constituted in terms of Act 15 of 1998). CapeNature currently manages 976,640 ha^2 of land and sea across the province and it is the entity responsible for the execution of stewardship agreements in the province. Recognising that most of the province's biodiversity exists on private land, CapeNature launched a Biodiversity Stewardship programme in 2003 to ensure agreements between the private landowners and CapeNature (CapeNature, 2022b). Through stewardship, landowners in possession of areas containing high biodiversity value become linked to formal conservation areas across the

landscape and engage in conservation stewardship activities while retaining control over what activities are allowed on their land, empowering them. Options for landowners range from establishing a nature reserve under contract with a long-term vision of preservation, conserving land through a biodiversity agreement for a period of time agreed upon by the landowner, establishing protected environments adjacent to other formally protected areas, and establishing a conservancy with flexible commitment timeframes. Landowners agree to protect portions of their properties and engage with CapeNature authorities to explore activities including land and fire management, alien species clearing, and ecologically minded income-generating activities such as eco-tourism and green businesses (CapeNature, 2022b).

2.4.2 Community-Based Conservation Management and the Sense of Place

In terms of the implementation of conservation management, some researchers acknowledge that "the future sustainability of local ecosystems depends upon… recogni[tion of] the importance of involving local communities" (Makunga et al., 2008, p. 365). Community-based conservation (CBC) strategies have also been defined as those where leadership from local and Indigenous communities form one (crucial) level of a multilevel governance strategies (Armitage et al., 2019).

Community-based conservation (CBC) is the concept whereby conservation and development occur simultaneously with one another. Developed in response to often exclusionary top-down approaches, CBC acknowledges the role humans play in the ecosystem and employs a participatory approach to ecosystem management rather than top-down methodology (Berkes, 2003). Proponents of CBC strategies believe that community involvement is an essential minimum qualification to achieving a commitment towards governing human-environmental interactions at the local level and ensuring support from a multitude of actors (Armitage et al., 2019). Researchers Strandby & Olsen (2008) highlight the importance of involving local communities in the management of *in situ* conservation areas.

Co-management of resources refers to the partnerships that exist amongst individuals hailing from government, communities, resource users and other actors (Hauck and Sowman, 2001). Co-management, however, often involves a spectrum of engagement approaches, including advisory, consultative, co-operative, and supportive (Hauck and Sowman, 2001). The balance of power between these individuals, however, is important to acknowledge to determine whether the system

is considered that which employs true co-management, where decision-making and power is fully shared.

True co-management includes the sharing of powers, functions, and benefits with communities rather than only involving them in consultative roles (Kothari et al., 2013). Some researchers have documented the value of involving communities through citizen science and participatory surveys as a means of incorporating community experiences into conservation efforts (Predavec et al., 2016).

One management model that has emerged to acknowledge the role of communities in conservation is Community-Based Natural Resource Management (CBNRM). In this model, communities form legal organised bodies which are then responsible for developing land use and natural resource management plans. Once plans are ratified, the communities themselves become custodians of the land and the natural products contained therein (Béné and Neiland, 2006). The limitation of the CBNRM model is that it relies on a community to form an organised and legal body, which can present challenges (Salerno et al., 2020). Across sub-Saharan Africa, CBC models have been set up to create biodiversity conservation alongside ecosystem service provision (Salerno et al., 2020). A major challenge to the success of CBC across the African continent has been associated with the lack of collaborative governance, showcasing that while communities might be involved, positions of leadership are often absent (Salerno et al., 2020).

Successful CBC schemes have been shown to be directly linked to the ecological knowledge of communities and their connection with place (Ruiz-Mallén and Corbera, 2013). An example of a successful co-management scheme is the French regional park system of shared governance where the elected management body is composed of local officials, community representatives, and political leaders (Kothari et al., 2013, Parra, 2012). Cited as “pioneering sustainability and decentralised governance objectives”, the French regional park model is an example where the citizen is actively involved in biodiversity protection at a localised level (Parra, 2012, p. 562). Here, there is an emphasis placed on establishing a combined nature-culture heritage, that is “socially participative” (Parra, 2012, p. 562).

In South Africa, during the better part of the 20th century, the ruling apartheid government emphasised policies of racial segregation, creating a divide between residential areas and access to jobs and services (Todes and Turok, 2018). In 1948, these discriminatory laws intensified as entire

communities were forcibly removed from land and sent to ethnically defined homelands (Todes and Turok, 2018). Along with this social exclusion came the loss of place identity (Dlamini et al., 2021). As a result, communities that may have once had a connection to a particular landscape and the ecology of that land, were displaced to the extent that their direct relationship with the land was broken.

In the early years following the end of apartheid, community-based (CBNRM) models were implemented as part of a post-apartheid redress initiative (Dafuleya, 2020). While CBNRM models are no longer supported in the country due to challenges with implementation, the concept of integrated governance between community, government, private sector industry, and non-governmental organisations (NGOs) remains. This is evidenced by models established through the SANParks national park system. Since the end of apartheid, SANParks has attempted to undergo a process of transformation through a number of programmes including the establishment of contractual community parks, expanded public works programmes, community projects, and programmes supporting bursaries and science (Kothari et al., 2013, South African National Parks, 2012). In 1995, SANParks established its Social-Ecology Unit, dedicated to establishing a relationship with individuals living adjacent to National Parks (South African National Parks, 2022). Established programmes encourage local communities to be involved as custodians of the national parks in their communities, and benefits include funding to carry our projects such as the creation of nurseries, health facilities, basic infrastructure, school transport, and study bursaries. In some of the parks, job creation in the tourism, biodiversity, and conservation management sectors have been funded (South African National Parks, 2012).

2.5 Tools to Manage Conservation and Sustainable Use

Various tools exist to manage the conservation and sustainable use of biodiversity. These range from the management of individual species to the management of entire landscapes, ecosystems, and habitats. This section focuses on the tools that exist within the South African context.

2.5.1 Biodiversity Management Plans

One of the ways in which *in situ* conservation can be achieved is through appropriate management of species within their habitats. One of the tools for managing conservation and sustainable use in

South Africa is the Biodiversity Management Plan (BMP). The aim of a BMP is to provide a unified, organised, and accessible platform to implement species protection (Department of Forestry Fisheries and the Environment, 2022a). BMPs can be used to determine the status of a species and resultant appropriate means to conservation. The BMP seeks to ensure the long-term survival of the species in the wild, while respecting the livelihoods of relevant stakeholders. NEMBA states that any person can create a BMP to contribute to biodiversity management (Department of Environmental Affairs and Tourism, 2004). The BMP can be for a specific indigenous species, a migratory species, or for an ecosystem. The species can be endangered, or one whose conservation status is threatened. To further the implementation of BMPs, the DFFE outlined a set of norms and standards in 2009 (Department of Forestry Fisheries and the Environment, 2022a). At the time of writing, two BMPs were published for comment (*Diceros bicornis* (black rhino) and *Pelargonium sidoides*), while only one had been published for implementation, *Encephalartos latifrons* (Albany cycad) (Department of Forestry Fisheries and the Environment, 2022a).

The contents of a BMP include a species assessment, distribution, background, ecology, endangered status, vulnerabilities, threats, and a list of conservation projects – both in place and proposed. Once a BMP has been drafted, all those involved in the species management, including those involved in the commercialisation sector, can use the information to better understand threats to the species or habitats they work with. From here, stakeholders can better define their role in contributing to conservation (Department of Forestry Fisheries and the Environment, 2022a).

2.5.2 Resource Assessments and Red Lists for Species of Concern

Resource assessments are carried out to determine which species may be under threat. A compilation of a list of species that are threatened are commonly assigned to a red list. In 1964, the International Union for the Conservation of Nature (IUCN) established a Red List of Threatened Species to indicate the status of a species as well as an entire ecosystem (International Union for Conservation of Nature, 2022). The IUCN Red Lists currently provide information on the “range, population size, habitat and ecology, use and/or trade, threats, and conservation actions” of a species to inform conservation decisions (International Union for Conservation of Nature, 2022). To determine the status of a species, assessments are carried out by several qualified groups including members of the IUCN Species Survival Commission (SSC), Red List Authorities, Red List Partners, or other specialists that work on IUCN-led assessment projects.

In South Africa, the South African National Biodiversity Institute (SANBI) conducts a Threatened Species Programme which involves the assessment of South Africa's Indigenous plants. The national assessments involve a 5-step process: information collection, assessment workshops, assessment review, publication of assessments, and updating of assessments (South African National Biodiversity Institute, 2020). The plants that have been assessed are listed on an online platform, the Red List of South African Plants Online. Major threats affecting South African indigenous species include: alien invasives (40% of taxa), crop cultivation (33% of taxa), urban development (20% of taxa) and habitat degradation due to overgrazing of livestock (11% of taxa) (South African National Biodiversity Institute, 2020).

2.5.3 Sector Development Plans

Broadly, a sector development plan (SDP) includes opportunities, aims, objectives, and challenges to development of a particular sector. Included in an SDP are policies and strategies that assist with achieving this development. The SDP for a specific GR or IBR contains the policies and management framework affecting conservation and sustainable use of that species, as well as the roles each of the sector participants plays in the support of associated commercialisation activities.

2.5.4 Harvesting Guidelines and Permits

The harvesting of wild species has been monitored in South Africa since 1938 with the aim of protecting species that were considered vulnerable (Davis, 1992, Privett et al., 2020). Today, the permitting processes related to the use of natural specimens in South Africa are governed in accordance with NEMBA (as outlined in section 2.2.2.1, above). In Part 2, Section 57, of the Act, "a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued" (Department of Environmental Affairs and Tourism, 2004, p. 52). Specifics pertaining to the requirements for the permits are outlined in Chapter 7 of the Act.

Each provincial conservation authority maintains autonomy over the issuance of specific permits to control harvesting. In the Western Cape Province, all those intending to grow or sell floral species, both protected and unprotected, are requested to apply for a permit (Provincial Council of the Province of the Cape of Good Hope, 1974, Ordinance 19: Section 65). Further, the Ordinance states that "no person shall without a permit, be in possession of, sell, buy, donate, receive as a donation,

pick, or import into, export from or transport in or through the Province, any endangered flora." (Provincial Council of the Province of the Cape of Good Hope, 1974, Ordinance 19: Section 62). An amendment was issued to the Ordinance in 2000 indicating that "any person desiring to sell endangered flora which he or she has cultivated on any fixed premises shall apply to the Board in the prescribed form for registration as a grower or endangered flora and a permit to sell endangered flora which has been cultivated and furnish it with the prescribed information and such further information as it may require" (Provincial Council of the Province of the Cape of Good Hope, 1974, Ordinance 19: Section 62, Sub-section 3).

In the Western Cape, the permitting processes related to use of flora are managed by CapeNature. Information required for the permits includes provision of the exact location of the premises involved, the scientific name of the species, what portion of the species is being extracted for use (seed, seedling, whole plant, flower), and an indication of whether the product is harvested from a naturally occurring supply or is cultivated. Table 1, below, outlines details of those who are required to apply for a permit.

Table 1. CapeNature: Application to Buy or Sell Protected Flora (CapeNature, 2021)

MARK WITH A 'X' WHERE APPLICABLE

Grow ☐ **Sell** ☐

Protected Flora ☐ **Unprotected Flora** ☐

MARK WITH A 'X' WHERE APPLICABLE

Property owner – Picking and selling of protected flora that grow naturally on his/her property		**Property owner who cultivates and sells naturally occurring protected flora on his/her property (NO ADMINISTRATION FEE REQUIRED)**	
Person who wishes to pick protected flora on someone else's property and sell said flora Please attach copies of the following to this application: 1. landowner's License to Sell / Grow Protected Flora 2. the Lease Agreement to Transfer the Picking Rights		**Person or business that wishes to purchase and sell protected flora** Please attach copies of the following to this application: 1. supplier's License to Sell / Grow Protected Flora 2. supplier's Registration Certificate	

2.6 Implementation Challenges within Conservation

Despite comprehensive regulatory framework, struggles with implementation persist. First, BMPs do not exist for all species, and require extensive intellectual investment and support. Accurate assessments of threatened areas and associated species can be inadequate due limited resources available for conducting threat measurements within natural and protected areas. Further, the management of wild areas is limited due to several factors, both monetary and non-monetary. One of the limitations is the lack of financial resources designated to conservation at a national level.

Another limitation is the structure of governance and the role the community may or may not play in the implementation of conservation. While shared-governance approaches as described above, acknowledge a role for community, without a real understanding of community structures, and addressing the power dynamics of *how* communities are involved, the realisation of desired conservation schemes can be ineffectual (Mulrennan et al., 2012). While responsibilities may be afforded to community members through stewardship, or even through related employment opportunities, redistribution of power can remain limited due to the perpetuation of top-down governance. A final barrier to effective conservation within the commercialisation of GR lies with the aspect of profits. Communities facing financial pressures may value financial gain through commercialisation activities and selling their rights to natural resources above CSU despite the reality that those short-term financial gains may or may not be equitably distributed.

The legal policy and framework and resulting conservation management processes presented portray an adequate coverage of the management of CSU activities within the South African context. An explanation of the study methodology as well as the study area is described in the next chapter to frame how these policies and conservation strategies apply to the buchu industry itself.

Chapter 3: METHODOLOGY AND STUDY AREA

3.1 Study Methodology

A qualitative research approach was used including the completion of a literature review and the collection of data through a series of semi-structured interviews and accompanying transect walks across wild harvested and cultivated landscapes.

Literature Review

A desktop-based review was conducted to review current literature outlining definitions of conservation and biodiversity, conservation strategies, the commercialisation of NTFPs, and biodiversity-related regulatory frameworks, results of which are presented in the previous chapter, *Chapter 2: Literature Review.* To conduct the review, online databases were consulted including: Google Scholar, and the University of Cape Town online libraries tool (Primo), providing access to articles, dissertations, patents, books, and book chapters. Further research was completed related to the history and ecology of buchu and is presented alongside research findings in *Chapter 4.*

Fieldwork: Semi-structured Interviews and Transect Walks

An initial list of potential participants was determined utilising a snowball sampling method (Crouse and Lowe, 2018) whereby referrals were made by researchers exhibiting previous research experience in the field of buchu, as well as those with experience studying the commercialisation of other indigenous NTFPs (Claudette Muller, Rachel Wynberg, Sthembile Ndwandwe). One advantage to utilising this referral method is that the likelihood of individuals agreeing to participate in research may be higher due to past participation. Another advantage is that previous researchers or other participants may assist with breaking down barriers that might otherwise inhibit communities or individuals from volunteering (Crouse and Lowe, 2018). Three main categories of participants within the buchu value chain were identified: producers (buchu harvesters, small and large-scale cultivators), users and processors, buyers, and regulators (National and Provincial Government Regulators, and conservation groups).

Fieldwork took place between October 2021 and July 2022, following the development of an initial list of participants. During this period, I conducted 22 interviews either in person or virtually in accordance with the feasibility and preference of each individual. Following the informed consent process, interviews conducted in person were recorded using a digital voice recorder. Virtual

interviews were conducted and recorded using the Zoom Video Communication (Version 5.8.3) and Microsoft® Teams (Version 1.500.8073) platforms. I used a student translator to transcribe all recordings and to translate and transcribe interviews that were conducted in Afrikaans, which is not my mother tongue. Interviews conducted are summarised in Section 3.2, Table 2, below.

A semi-structured qualitative questionnaire (Appendices 2 (English) & 3 (Afrikaans)) was developed to elicit information in a guided, yet open-ended manner from participants in accordance with best practices for the use of such a methodology (Jamshed, 2014). Applying structure to the interviews ensured each one, which was to be conducted only once, would satisfy the project's aim and objectives. At the beginning of each interview, an open-ended question was asked about the participant's background and how each became involved in the buchu value chain. This method was used to put the participant at ease and allowed for a better understanding of the individual's role to be defined. The questionnaire was designed to collect data across the following areas of interest: 1) knowledge and perspectives of biodiversity, conservation, and sustainable use; 2) knowledge of and role in buchu commercialisation; 3) conservation and the buchu industry, and (4) the future of conservation with a focus on the buchu sector and Cederberg region.

A total of six tailored questionnaires was developed to include relevant questions for each of the participant groups, while variations amongst participants within participant group categories led to further discretionary elimination of certain questions, such as familiarity with specific regulations.

3.2 Profile of Participants

Table 2, below, provides a summary of the different categories of interviewees and the total number of participants within each category.

Table 2. Summary of Interviewees

Actors	***Number of Participants***
Buchu harvesters *Elandskloof* *Cederberg region (from Cape Town)*	 5* 2
Small-scale buchu cultivators *Elandskloof*	 5*
Large-scale buchu cultivators	3

Processors and Users	5
Government Regulators and Parastatals	3
International/Domestic Buyers	4
Total	*22

**Elandskloof community members engaged in both wild harvesting and small-scale cultivation and are counted in both categories, but only counted once towards the total.*

All interviews with participants working in the Cederberg area were conducted in person and were followed by transect walks. Interviews were conducted with large- and small-scale cultivators, tea and oil processors, and wild harvesters. A large-scale commercial farm involved in both wild harvesting and cultivation of buchu was visited, and semi-structured interviews were conducted with two of the farm owners, as well as with the farm manager. Farmers were asked about the history of buchu in the area and their involvement and development of cultivation as well as their involvement in conservation across the region. Transect walks through cultivated and wild landscapes examined the topography of the land, the native vegetation, natural and man-made irrigation systems, and the current and previous planting locations. The rural village of Elandskloof (Figure 4) was identified as a community with a history of both small-scale buchu cultivation and wild harvesting. During a visit to the village, five semi-structured interviews were conducted with individuals specifically involved in both small-scale cultivation and wild harvesting activities. Perspectives from community members at Elandskloof were used to provide insight into small-scale buchu production as well as to whether benefits arising from ABS agreements have impacted their local community.

The perspectives of local processors were solicited through five interviews. Three semi-structured in-person interviews were conducted with distillers operating in Citrusdal and Piketberg, and three others were conducted virtually. These interviews provided information about the production of processed products as well as information about the past and current domestic and international markets and market trends.

Finally, interviews were conducted with one key regulatory informant from the Department of Environmental Affairs and Planning (DEADP) and two representatives from the parastatal research organisation, the South African National Biodiversity Institute (SANBI). Interviews with these participants aimed to gain perspectives from a regulatory perspective in terms of what legislation

exists to manage buchu as a resource, as well as challenges faced by the current system in terms of implementation of the national and provincial legislation and monitoring of resources. Representatives commented on future conservation policy and implementation ideas within the buchu industry and amongst its actors.

The details of the participant interviews including the category of individuals interviewed, locations, and dates, are found in Table 3, below.

Table 3. Semi-Structured Interview Details

Actors	***Location***	***Date of Interview***
Wild harvester A	Cape Town	10 Feb 2022
Wild harvester B	Cape Town	10 Feb 2022
Elandskloof Harvester A	Elandskloof Village	09 July 2022
Elandskloof Harvester B	Elandskloof Village	09 July 2022
Elandskloof Harvester C	Elandskloof Village	09 July 2022
Elandskloof Harvester D	Elandskloof Village	09 July 2022
Elandskloof Harvester E	Elandskloof Village	09 July 2022
Large-scale Farm Owner A	Cederberg Municipality	20 June 2022
Large-scale Farm Owner B	Cederberg Municipality	20 June 2022
Large-scale Farm Manager	Cederberg Municipality	20 June 2022
Processor A	Cape Town	21 Oct 2021
Processor B	Online platform	21 Jan 2022
Processor C	Cape Town	11 Nov 2021
Processor D	Cape Town	25 Nov 2021
Processor E	Online platform	01 Dec 2021

Government Regulator A	Online platform	15 Nov 2021
Government Parastatal A	Online platform	15 Mar 2022
Government Parastatal B	Online platform	02 Dec 2021
Buyer A	Online platform	11 Nov 2021
Buyer B	Online platform	04 Nov 2021
Buyer C	Online platform	27 Oct 2021
Buyer D	Online platform	10 May 2022

3.3 Data Analysis

I conducted qualitative data analysis from the transcriptions utilising the Dedoose Qualitative Data Analysis Software package (Version 9.0.46). Qualitative data analysis methodology is used to analyse and code qualitative data collected from semi-structured interviews (Busetto, et al., 2020). This type of analysis enables questions that are nuanced to be better grouped and analysed when responses are not objective and when responses involve words rather than numbers (Busetto, et al., 2020). The Dedoose package enables qualitative data and text to be coded into a set of themes. During the analysis process, the user uploads documents directly onto the system and manually assigns codes to the text. Codes added to each subsequent document create a project codebook. The codebook provides an emergent set of themes highlighting similarities and differences amongst and between groups of participants. The software enables the data or quotations from each participant's interview to be grouped for easy comparison and for quotations to be drawn out from the interviews. I used Microsoft® Excel for Mac (Version 16.56) and Microsoft® Word for Mac (Version 16.59) to create tables to display data from the interviews.

3.4 Study Area

The largest number of harvesters, cultivators, and processors are located within the Cederberg Municipality in the northern portion of the Western Cape Province. The municipality of the Cederberg is marked by the town of Clanwilliam in the northeast and Citrusdal in the southeast and extends westward towards the Atlantic Ocean and the towns of Lamberts Bay and Elands Bay (Figure

2). The natural distribution, cultivation, and associated production activities of buchu are limited to the mountainous areas across the eastern portion of the municipality including the Cederberg Wilderness Area and the Cederberg and Winterhoek Mountain Catchment Areas. The predominant natural vegetation type throughout the area is Mountain Fynbos, with commercial farming activities taking place in the valleys below.

The municipality itself has a fairly small and sparse population (<50,000 people, 6 people per square km) (Statistics South Africa, 2022). Approximately 2,031 of the municipality's 13,513 households (15%) are involved in agricultural production (Statistics South Africa, 2022). Of the farming households, 32.6% are involved in vegetable farming, while 28.1% are involved in livestock production (Statistics South Africa, 2022). Agricultural activities take place predominantly in the valleys throughout the area, where farms often share borders with the wilderness area and nature reserves. Both production and processing of buchu take place within the municipality, with distilleries located on or next to cultivation and wild harvesting locations. This is advantageous to the industry as it eliminates the costs associated with transporting raw material.

The three maps below depict the overall study area and characteristics of the landscape in which it lies. The first figure (Figure 2) depicts the overall characteristics of the Cederberg Municipality and its location within the context of South Africa. The area's land composition and isolated stands of fynbos are visible.

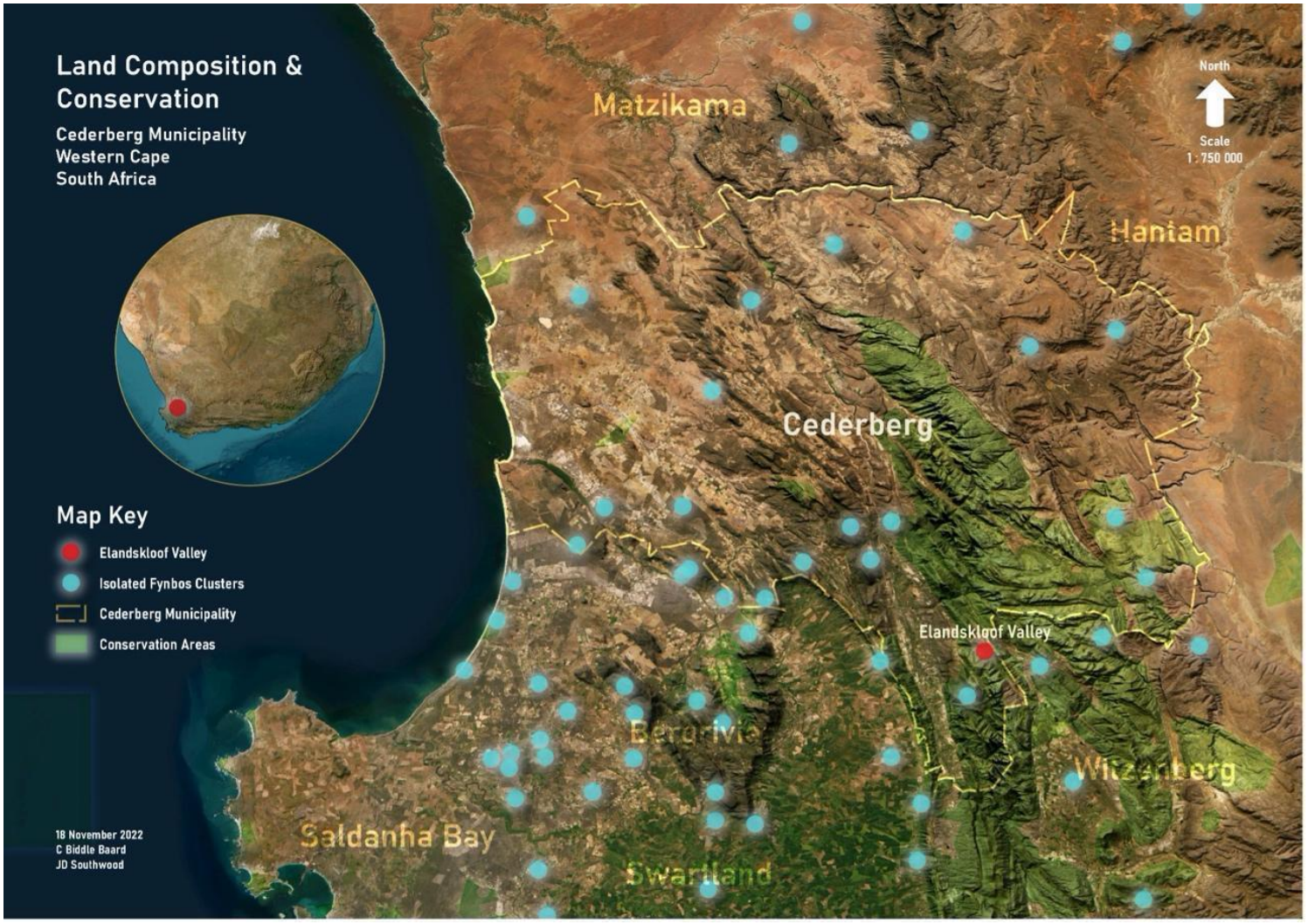

Figure 2. Land Composition and Conservation, Cederberg Municipality, Western Cape, South Africa

Figure 3 depicts the land composition in more detail across the southern Cederberg Municipality where buchu is endemic. The western portion of the area is dominated by farming activities, with three isolated private nature reserves (the blue areas across the map) which are nestled amongst the agricultural areas and transformed land. To the east, there is a significant amount of protected land including the Cederberg Wilderness Area (CWA), the protected greater mountain catchment area, and several provincial and private contract nature reserves, indicating that this area is largely untransformed. The CWA itself consists of 66,811 ha of land which has been protected since 1973 and managed by CapeNature (CapeNature, 2022a). The area was named after the high-altitude cedar trees growing amidst the sandstone karsts that make up north-south orientated mountainous terrain. The area is located within the CFR and has been designated as a World Heritage Site. Stands of isolated natural fynbos vegetation areas are dotted in and amongst the farming areas, as well as within the protected areas. Fynbos vegetation existing on privately owned land is more threatened by the potential expansion of agricultural activities than that which exists within the protected areas.

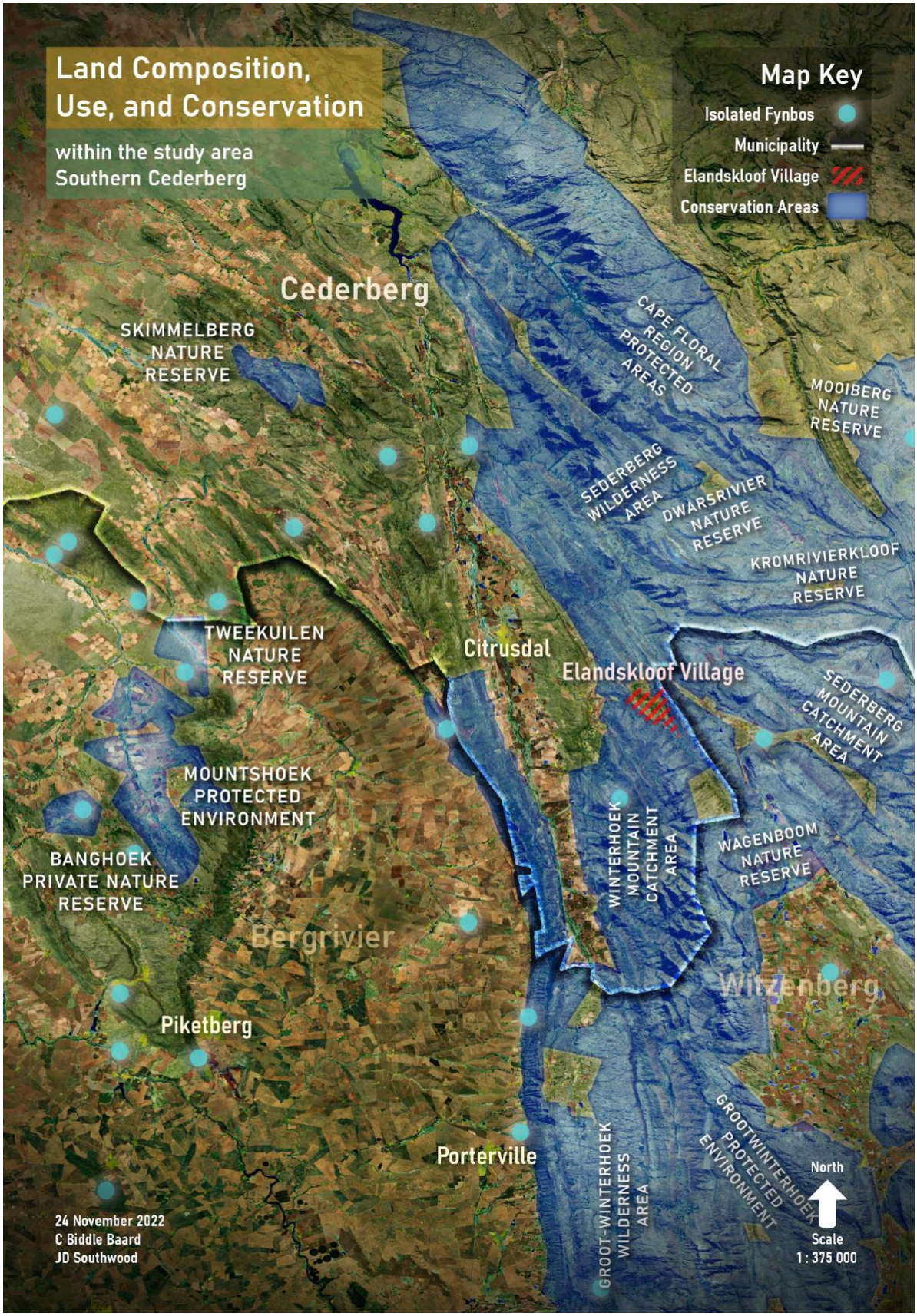

Figure 3. Land Composition, Use, and Conservation, Southern Cederberg Region

Figure 4 portrays the village of Elandskloof and the surrounding protected areas, including the Winterhoek Mountain Catchment Area, the Groot Winterhoek Wilderness Area, and the Cederberg Wilderness Area. Interviews with individuals involved in small-scale cultivation and wild-harvesting activities were conducted in Elandskloof. Access to the village is through a single-laned unpaved track running into the middle of the steep valley and ending at the mountain catchment area. Being surrounded by mountains on three sides affords the valley natural topographic protection from further expansion. During the early and middle parts of the 1900s, commercial farm activities took place along the riverbanks in the centre of the valley and has caused soil erosion and subsequent invasion of alien vegetation. Buchu cultivation currently takes place along the higher altitude borders between the village and the catchment areas where the soil has remained largely untransformed and retains its natural composition.

Figure 4. Land Composition and Use in the Elandskloof Village

3.5 Study Limitations

This project is largely based on qualitative data collected through self-reported methods inherently limiting the applicability of its results. To address this limitation, the semi-structured questionnaires were written to obtain consistent responses from a variety of participants. While the snowball sampling method eliminates the ability to gather data in a more randomised manner, the buchu value chain is very small, and thus, the chances that a biased sample was obtained, is lower. The anonymity of the research process aided in the effort to increase the validity of the data gathered from participants and no participant lists or identities were shared between participants aside from those who had been openly referred by others.

3.6 Ethical Considerations and Approval

Ethical approval for the study was granted by the University of Cape Town, Department of Environmental and Geographical Science (EGS) (FSREC, 2020). Prior to the start of each interview, each participant was given a copy of the approved consent form (Appendix 1). Either verbal (recorded) consent or written consent was obtained by each of the participants. All data, including audio recordings obtained through the interviews was kept on a password protected server hosted by the University of Cape Town. Feedback of the findings will be summarised in a leaflet and taken to the participants and will be available in both English and Afrikaans.

Chapter 4: The Commercialisation of Buchu (*A. betulina* and *A. crenulata*)

4.1 Distribution and Ecology

Figure 5. Wild growing buchu, *Cederberg Region (Photo credit: L Chicken)*

The genus *Agathosma* (previously *Barosma*) contains 163 species, making it the fourth largest plant family in the CFR. Of these, 159 are endemic to South Africa (Manning and Goldblatt, 2012). Two of the species are commonly known as "buchu" and are harvested and cultivated for their aromatic and medicinal properties: *Agathosma betulina* and *Agathosma crenulata* (Manning and Goldblatt, 2012, Moolla and Viljoen, 2009, Skosana et al., 2014). The distribution of buchu is extremely localised with the two species being endemic to disparate locations. *Agathosma betulina* is found in the Cederberg Mountain region from Nieuwoudtville in the north southwards through the rural areas outside the towns of Clanwilliam, Citrusdal, Piketberg, Saron, and Tulbagh (South African National Biodiversity Institute, 2021). *Agathosma crenulata* is found further south from Tulbagh and Gouda towards Stanford, and east towards the Outeniqua Mountains (Department of Agriculture Forestry and Fisheries, 2011, Scott and Springfield, 2004, South African National Biodiversity Institute, 2021).

Agathosma betulina and *A. crenulata* are found in the winter rainfall regions of the Cape at altitudes above 500 metres (African Aromatics, 2021). Both sub-species are adapted to cold winters with temperatures between 6 °C and 17 °C and hot dry summers with temperatures between 15 °C and 38 °C (Department of Agriculture Forestry and Fisheries, 2011). *Agathosma betulina* is a small, multi-stemmed bush growing to a height of 1 metre. It is characterised by its round leaves and is adapted to the sandy soils and arid conditions of the Cederberg region. *Agathosma crenulata* is a single-stemmed plant growing to a height of 2.5 metres and is naturally found towards the middle of mountain slopes in silty, shaly soils and nearer to water sources. Both species prefer acidic (pH3.5-pH4.5) soils but can tolerate alkalinity up to pH 5.5 (Department of Agriculture Forestry and Fisheries, 2011). Both species grow in soils with low salinity, nitrate, and phosphate levels (below 20 parts per million (ppm)) and tolerate higher levels of potash and sulphur when in the wild (Department of Agriculture Forestry and Fisheries, 2011). Both species of buchu plants take between

4 and 6 years to mature after being seeded in cultivated plantations (Xaba et al., 2009). For *A. betulina,* the main harvesting period is during the mid- to late-summer months from January through to April, while, for *A. crenulata* the harvesting period is slightly earlier, from November through January. Both species are hand harvested. The recommended harvesting methods differ slightly between the two varieties due to differences in their physical traits. The shrub-like *A. betulina* is recommended to be harvested 5cm above the ground. The stalk-like *A. crenulata* is pruned of its branches starting 40cm above the ground, while the main stem is left in-tact (Department of Agriculture Forestry and Fisheries, 2011). Figures 10, 11, and 12 depict the tools and harvesting process. Harvesters are deployed into fields with large grain sacks and forks to separate out the surrounding grasses that have grown up around the plants. After the grasses are removed, they trim the bushes and fill grain sacks. Figure 12 depicts two rows of harvested bushes on the left, with one row of bushes on the right that has been cleaned of grasses but awaits harvesting. Sustainable harvesting techniques ensure that bushes continue to produce for more than 30 years through the application of organic farming methods and drip irrigation techniques (Industry Representative 1, Industry Representative 3).

Processing

After harvesting, raw material is either dried for use as a tea or processed in an oil distillery. The drying process takes place on site at the farms, and the production of buchu oil either takes place on or close to farming and wild harvesting areas. The transportation costs of wet material have driven some of the larger farms to set up their own local distilleries, keeping oil production in house (Processor A). Figures 14 and 15 depict a distillery located on site of one of the largest buchu cultivation farms in the Cederberg. While the oils themselves come from the leaves, leaves and stems are distilled together as the leaves are too small to be manually separated. Oil is tested for its chemical properties and active ingredients in batches before being aliquoted or sold. One ton of wet buchu vegetation produces an estimated one kilogram of distilled oil (de Ponte Machado, 2003, Xaba et al., 2009). In South Africa an estimated 500-1000 kg of oil is produced annually, though an essential oils report indicates that production figures for essential oil processors (including buchu) are not often shared publicly (Triumph Venture Capital (Pty) Limited, 2004). Buchu oil is considered one of the country's minor essential oils, ranking 9th amongst locally produced essential oils (Triumph Venture Capital (Pty) Limited, 2004). While publicly available costs of buchu are difficult to locate, in 2003, buchu prices (distilled oil) were documented as being as high as ZAR 15,000/kg (Triumph Venture Capital (Pty) Limited, 2004). Further, published market costs of buchu raw

materials (leaves and oil) are not available as the industry maintains privacy in terms of pricing (Triumph Venture Capital (Pty) Limited, 2004). The South African Essential Oil Producers Association (SAEOPA) has listed buchu on a proposed primary list of attractive essential oil crops (Triumph Venture Capital (Pty) Limited, 2004). Further, cultivation of buchu is promoted as being attractive even at a small-scale as oil prices are significant enough to make buchu a competitive complimentary crop providing supplementary income (Van Wyk and Prinsloo, 2018).

4.1.1 Conservation Status and Threats

Conservation Status

According to the SANBI Red List of threatened species, a 2016 resource assessment lists both *Agathosma betulina and A crenulata* as species of least concern (Trinder-Smith and Raimondo, 2016). The assessment included over 40 locations covering an estimated 4624 km^2. A previous assessment conducted in 2009 listed the species as declining. While the more recent assessment still documents the vulnerability of the species due to its extreme endemicity and threats caused by overharvesting, it is estimated that these threats only affect up to 10% of individuals (Trinder-Smith and Raimondo, 2016). The assessors further indicate that the current regulations on trade as well as the promotion of cultivation of the species bode well for a continued population rebound (Trinder-Smith and Raimondo, 2016). One regulator commented during the interview process, that due to the widespread distribution of buchu along remote mountaintops, many of which occur within protected areas (CapeNature), or on private land that is generally unsuitable for common agricultural cultivation, there is an assumption that those entire habitats areas are not under threat and will remain untouched (Government Parastatal A). Another regulator acknowledged that the methodology of the species assessment itself, extrapolating the location of buchu by means of walking through the veld and documenting individual plants, is limited in its applicability to properly assess buchu due to its extremely remote geographical distribution (Government Parastatal B). In contrast to this assumption, however, researcher Rabinowitz (1981) cites that individual species are particularly susceptible to harvesting pressures if they have a narrow geographic distribution, are found in a specific habitat, and have a small population size within that habitat, a description that describes the characteristics of buchu and renders it less resilient and therefore susceptible to species decline.

Threats

Buchu is threatened by two categories of activities, those caused by the buchu industry itself, and those caused by non-industry related factors. Despite not being listed as a threatened species, buchu is listed as a protected species, and remains "highly vulnerable to extinction" and thus permits are required for those engaged in harvesting, cultivating, processing, and any associated buying and selling (Trinder-Smith and Raimondo, 2016).

One of the main threats driven by the industry includes over harvesting and improper harvesting from buchu plants growing in the wild. Examples of this include pulling up the entire plant with its root system, harvesting during the wrong time of the year and during periods of growth (rainy season), and harvesting stalks when the plant is flowering or when seed pods are still attached to the plant and disrupting the natural fertilisation cycle. Harvesting of buchu from wild areas can also have a detrimental effect on surrounding fynbos vegetation as it can become trampled by harvesting teams.

Another industry-driven threat is an increased demand from overseas and an associated higher price for buchu oil. A government regulatory participant who is also involved in producing products derived from buchu at a small scale, noted that during periods of high oil prices, farmers who have not otherwise been involved in the buchu value chain, have added buchu cultivation to the top edges of their farms, encroaching on wild fynbos growing there (Government Regulator A). This agricultural expansion occurs in one of two ways: through the clearing of all native vegetation in favour of planting buchu seedlings that have been propagated off site, or through clearing all non-buchu fynbos plants away from existing mature bushes to encourage them to grow in an environment without competition for water resources from other plants. In speaking with other participants involved in production and farming, it was reported that it was much more common to clear land to plant buchu seedlings as it would be very unlikely that many buchu bushes would be naturally growing near to one another, and therefore to maximise the productivity of the area, a higher density of plants would be desirable (Large-scale Farm Owners A & B).

As a fynbos species, buchu is dependent on fire for the nutrients that are released into the soil and for seeds to be released from their protective pods following exposure to heat and smoke, facilitating the germination process. One farmer commented that while "buchu seed can lie underground for years, it won't grow if there is a thick bush above it. [It] will grow as soon as the fire

and nature burn it… You won't have buchu left in the veld if the buchu isn't helped, for example, if the veld isn't burned like it ought to be" (Large-scale Farm Manager).

Despite the need for fire events, fynbos can be damaged if the fires are too frequent, or if the fires are coupled with extended periods of drought (Trinder-Smith and Raimondo, 2016, van Deventer et al., 2016, Botha et al., 2004). Repetitive and extended fire events result in the destruction of biomass beneath the soil and the protective layer of the seed pod but can also result in the destruction of the seed itself due to heat exposure. Climate change and increased human-caused fire events is affecting the cycle of naturally occurring fire events, and the persistence of these threats was confirmed by buchu farmers during the interview process.

A 44-year study of permanent fynbos vegetation stands conducted by Slingsby et al. (2017), chronicles how an increase in the CFR's average maximum and minimum temperatures has contributed to localised weather patterns after periods of fire. Droughts occurring both before and after fire events have created extensive damage to fynbos. When extended periods of drought have occurred after fire, seed germination fails. Seeds, once released, also need to be exposed to precipitation to complete the germination process, and if a fire event is not followed by a period of rain, the seeds will dry out and fail to sprout. The presence of alien vegetation can also contribute to an increased intensity of fire by producing hotter fire conditions. The dominant types of alien vegetation persistent throughout transformed sections of the fynbos landscape are from the *Eucalyptus*, pine (*Pinus pinaster)*, and Australian *Acacia* (black wattle) families of trees. The first two families of trees contain high levels of gum in their leaves, needles, cones, and stems, fostering an increased intensity of fire through the expulsion of excessive oils during fire events. Black wattle releases seeds much like the fynbos plants do, and the seeds germinate and spread during fire events, further dominating the landscape, and competing with native vegetation. A statistically significant species loss occurs amongst other low endemic shrubs (rutaceous) that cannot grow amongst alien vegetation, while overall ecosystem function is impaired (Slingsby et al., 2017).

There remains a complexity surrounding the role of fire in cultivated landscapes, however. While older buchu plants can survive a fire, seedlings will not, and young plants would need to be protected from fire events with a system of prescribed burns being put into place to control the burning time and heat (Elandskloof Harvester A).

Another natural threat to buchu is due to pests and parasites including: “soft scale, hard scale (‘dopluis’), plant-lice, cutworms, stem-borer beetles, snails, leaf-miners, root-knot nematodes, and harvester termites’’ (Department of Agriculture Forestry and Fisheries, 2011, p. 5). While these pests can be controlled on other crops in non-organic farming conditions, they persist on buchu plantations as buchu does not react well to the use of pesticides. One globally prevalent threat is the soil-borne mould *Phytopthera cinnamomic* which affects many fynbos species including buchu and causes the plant’s roots to rot (von Broembsen, 1979). Another pathogen threatening buchu is *Fusarium* wilt, a fungal disease. *Fusarium* wilt can affect both wild and cultivated species but is primarily found in cultivated varieties as it is contagious between plants and wild varietals are rarely found near one another. If it is discovered in cultivated plants they should be removed and burned, and the hole should be treated to prevent the disease from spreading across fields (Department of Agriculture Forestry and Fisheries, 2011). Pests and disease are rare amongst wild buchu plants and generally tend to occur in isolated incidents. This may have to do with the plant’s sparse distribution between other types of fynbos. Multiple buchu bushes in a concentrated stand are scarce, thereby reducing the likelihood of the spread of infection.

Possibly the most detrimental threat to buchu is the encroachment into natural fynbos environments caused by human population growth, but more acutely caused by agricultural expansion (Botha et al., 2004, Trinder-Smith and Raimondo, 2016, van Deventer et al., 2016). Across the fynbos landscape, the expansion of the wheat, pastureland, citrus and viticulture industries in particular, threaten already endangered and dwindling stands of fynbos (Fairbanks et al., 2004). The steady increase in the demand for exported produce and other agricultural products since the end of apartheid has fuelled rapid farm expansion across the Cederberg area to serve a new global market. While traditionally planted in the lowveld areas, a trend in the viticulture industry has been for red grape cultivars to be planted on increasingly steeper slopes at higher altitudes threatening wild growing mountain fynbos species such as buchu (Fairbanks et al., 2004).

4.1.2 Challenges with Species Monitoring

Control and enforcement of wild harvesting remains a challenge. Wild harvesting locations themselves render monitoring of the methods of the harvesters quite challenging (Williams and Kepe, 2008). Further, the capacity of institutions to monitor wild populations remains poor (Shackleton, 2009). While harvesting is intended to occur on privately owned land, this is often adjacent to protected conservation land, and the borders between private land and conservation

land are porous, as fence lines rarely extend along the mountain edge of the properties. While some farmers indicate that they have been involved first-hand in the training of their harvesting teams, others indicate that they "haven't sat down and had training with them" but that they "plan to go over the basics of sustainability" though the individuals "have been harvesting for a long time" (Processor A).

4.2 History and Use

Derived from practices of the Indigenous peoples of southern Africa, including the Khoikhoi and San Indigenous groups, the use of buchu was documented as early as the 1600s (Low, 2007). Historically, the term 'buchu' was used to describe a family of fragrant plants that were dried and powdered (Moolla and Viljoen, 2009). Written documentation on the uses of buchu is limited to early European observation in association with botanical explorations of the Cape region so it does not account for use by Indigenous communities (Low, 2007). In these early recollections, European explorers indicated that Indigenous people applied the leaves from plants to the skin to treat wounds, while oil from the leaves was used in conjunction with animal fats and applied topically to protect "against the danger of sun, cold or disease" and to the skin of newly born babies and allowed to dry to protect from rashes (Low, 2007, p. 337).

In Europe, by the 1750s, the cultivation of buchu was borne out of "botanical curiosity" and was planted at Kew Royal Botanical Gardens in England (Low, 2007, p. 340). At this stage, buchu was used solely for its fragrant qualities, while across southern Africa, Indigenous communities were engaged in aromatherapy practices and applied the perfumes as part of the healing process (Low, 2007). By the 1800s, however, European settlers in the Cape had adopted use of buchu for its medicinal properties and the plant was often mixed into brandy and consumed as a tonic (Low, 2007). Shortly thereafter, Europeans began to demand buchu from the Cape and the industry thus developed into a global market. By the mid-1800s, buchu was introduced to the United States, at which point, three *Agathosma* sub-species dominated the markets: *Agathosma betulina, Agathosma serratifolia,* and *Agathosma crenulate* (Low, 2007).

It wasn't until the early 2000s that the efficacy of health benefits from chemical compounds found in buchu began being tested through formal clinical trial studies (Moolla and Viljoen, 2009, Huisamen, 2019, Ultra International B.V., 2021). These studies revealed health-promoting effects associated with *Agathosma* extracts including anti-inflammatory, anti-hyperglycaemic, and anti-hypertensive

effects without documentation of any adverse events in association with consumption (Huisamen, 2019, Moolla and Viljoen, 2009, Ultra International B.V., 2021). Chemical analysis of the *Agathosma* species revealed the predominant active chemical compounds to be: hesperidin, rutin, diosmin, quercetin, and pulegone (Huisamen, 2019, Moolla and Viljoen, 2009, Ultra International B.V., 2021). Throughout the 19th and early 20th centuries, *A. betulina* emerged as the dominant sub-species on the market due to its higher diosmin content (the chemical compound known to increase blood flow) and lower pulegone levels, which is toxic at higher concentrations (Low, 2007, Moolla and Viljoen, 2009). As a result, *A. betulina* contributes to a larger proportion of the natural products including those which can be consumed orally, while the use of *A. crenulata47* is confined to aromatic applications.

4.3 The Buchu Value Chain

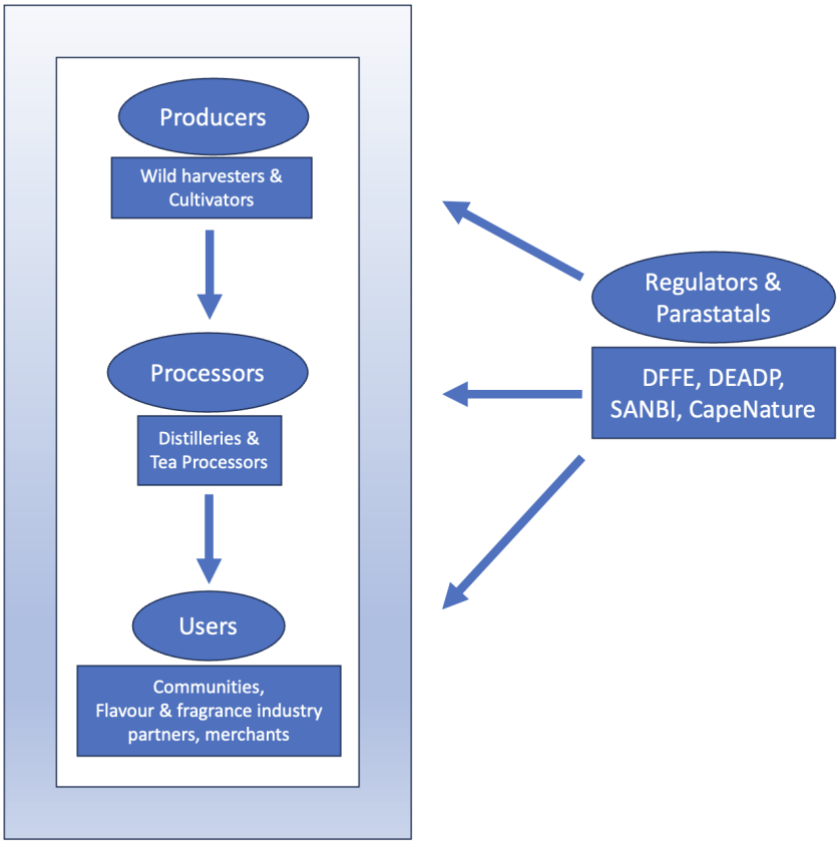

Figure 6. The Buchu Value Chain

The above figure has been constructed as a visual representation of the participants in the buchu value chain. The four main categories include producers, processors, users, and regulators and parastatals.

4.3.1 Producers

Producers of buchu include those who are involved in wild harvesting activities as well as those involved in cultivating activities on plantations or farms, with many of the cultivation activities taking place adjacent to wild harvesting areas. The producers are located within the Western Cape Province due to the natural distribution of buchu as well as the particularity of the soils required for cultivation.

4.3.1.1 Wild harvesters

The demographic profile of wild harvesters in the buchu sector is diverse. Some wild harvesters are community members residing near the mountains where buchu is found. Large-scale farms have their own teams of harvesters that harvest from wild areas of privately-owned land. These harvesters are otherwise employed full-time by the farm to harvest cultivated buchu as well as conduct farm activities related to other crops that might be under cultivation. Smaller-scale farm operations without large numbers of permanent staff hire out teams of seasonal or migrant workers to harvest buchu from private land (Processor A, Processor B, Large-scale Farm Owner A, Large-scale Farm Owner B). One farm in the area indicated that the wild harvesting on their land takes place every two to three years and last for 1-2 days per year in accordance with the natural growth rates of the wild plant varieties (Large-scale Farm Owner B, Elandskloof Harvester A). The growth rate of *A. betulina* in natural settings is slower than in cultivated environments receiving supplemental irrigation, thus the yields from wild harvesting are relatively low as compared to those from the plants that are under cultivation. Despite the superior growth rates, the large-scale farm owners both surmised that wild harvesting activities will continue as the flavour profile is different from the cultivated varieties and is thus still demanded from consumers (Large-scale Farm Owners A & B). For some, harvesting from the wild provides an income that otherwise supplements small scale cultivation activities and acts as a means of job creation (Elandskloof Harvester A).

The regulator, parastatals, and wild harvesters from the Elandskloof community indicated that harvesters from outside of the region come to harvest in the mountains. These harvesters include individuals from the sackcloth community in Cape Town who travel long distances (±200km) from Cape Town to harvest buchu from the Cederberg region (Government Regulator A and Wild Harvesters A & B). The sackcloth community consists of individuals with historical links to Khoikhoi and San Indigenous peoples (Collins, 2016). For those travelling from Cape Town, harvesting occurs in a concentrated period, usually a few days. Wild harvesters remain in the hills for days at a time

before filling large sacks to transport down the mountains (Wild Harvesters A & B). Harvesters claim that this extended harvest is the only way that they can offset the associated transport costs of the long journey from the city (Wild Harvesters A & B).

4.3.1.2 Cultivators

Cultivation of buchu occurs both at small and large-scale. Due to the specificity required by the plant itself, the cultivators of *A. betulina* are located in close proximity to the location where the plant is found in the wild (See Section 4.1). Large-scale cultivators are defined as those that are involved in cultivating and wild harvesting activities at a commercial scale. Large-scale buchu farms are up to 30 hectares in size and involve teams of farmers involved in propagation of seedlings, planting, and harvesting activities. Large-scale farms utilise irrigation systems to maximise rates of growth. Large-scale commercial farms within the buchu industry are those that farm on large areas of land exceeding 20 hectares. Small-scale cultivators are those that are involved in cultivation on small plots of land of less than 5 hectares up to 20 hectares. Small-scale cultivation activities rarely involve irrigation, though even small-scale irrigation can be used, especially in the first few years after planting. Small-scale cultivated plots are generally located within communities and buchu comprises one of many species that is under cultivation. Buchu grown at a small-scale is harvested for personal use in the form of tea but is also sold to processors for distilling. At both small and large-scale, seedlings are either purchased from suppliers or propagated from seeds collected on private land where wild harvesting activities take place. Permits to trade are applicable to cultivators of any size.

The Elandskloof Community, Cederberg Municipality

The community of Elandskloof is one of few locations where buchu is cultivated on a small scale. Located in a valley just outside the town of Citrusdal, the Elandskloof Village boasts community members involved in both wild harvesting and cultivation activities. This area, initially established as Dutch Reformed Church Mission Station in 1862, provided access to land for freed slaves, an alternative to working for previous slave-owners as permanent farm labourers (Anderson 1993, Barry 2011). Elandskloof thus became a location where freed slaves began to cultivate their own crops, primarily for subsistence, and to raise livestock. Despite challenges of depression post World-War II, residents reportedly preferred communal living offered by the mission station to working under permanent farm labour conditions of service (Anderson 1993).

During the 1940s and 1950s, as part of the South African Apartheid government's mandate, officials began to dismantle and dispossess black communities of land. Elandskloof was identified as a community to be disintegrated as it was determined that the land it existed on was to be declared a "whites only" area. The land was sold to a private farmer who proceeded to transform the community and surrounding land into a large commercial farm (Elandskloof Harvesters A & B). Fences were removed and reconstructed through residents' gardens where cultivation was taking place and homes were separated from the access road and from the water supply; trees were uprooted, and existing crops and gardens were ploughed (Anderson 1993). In the creation of fire breaks, residents' houses were destroyed, yet compensation or efforts to engage in mitigating the damage, though possible, never occurred (Anderson 1993). Nearly 600 cattle, sheep and goats owned by the Elandskloof residents were impounded by the new landowner and sold to surrounding farmers. The only option that was given to the residents was to forfeit their traditional rights and land and become labourers. This offer was refused, and by 1962, the forced removals ensued (Anderson 1993)

As residents were removed, their dwellings in the valley were burned, presumably to discourage resettlement (Elandskloof Harvester A). One resident recalled, "we were thrown out of Elandskloof with what we could carry. I had my little dog, and I carried my small milk bucket. The house was left behind. My mom took what she could and tied it into a sheet or a tablecloth – food for us to eat and bedding for us to sleep on next to the side of the road. We had to sleep next to the road. Nobody speaks about it today. They talk about the suffering, but nobody talks about what happened here. When you speak to other people you will see that no one speaks about it." (Elandskloof Harvester A)

Many were forced to live in the bush before they managed to begin the search for jobs on neighbouring commercial farms. Current Elandskloof residents indicated that some moved to nearby towns including Atlantis and Citrusdal, in search of work, while others moved further away to Stellenbosch and Cape Town (Elandskloof Harvesters A & D, Anderson 1993). In 1996, in the first restitution case in accordance with the Restitution of Land Rights Act 22/1994, the government purchased the area, and the Elandskloof Communal Property Association (ECPA) was formed and established as the landowner. Former residents were then allowed to move back into the valley onto the communal land. Despite the resettlement, the ECPA has struggled to function, and poor management has reportedly prohibited advancement of the residents (Barry 2011).

Following what had been years of commercial farming, at the time of the resettlement, the valley had been transformed. Alien vegetation had invaded the land and areas along the natural flow of the river. Fruit trees (citrus) were farmed lower in the valley on either side of the Elandskloof River (Elandskloof Harvester C), presumably impacting the soil composition. At higher elevations, the soils retain their original state, and small-scale buchu cultivation has had greater success.

4.3.2 Processors and Users

Buchu processors can be divided into two categories: those that dry and process tea, and those that distil oil. Processing occurs both on-site where cultivation occurs as well as at stand-alone off-site distilleries. Efforts are made to minimise the shipment of raw buchu material due to transport costs. As a result, tea is either packaged onsite or sold to tea merchants that then package the raw, dried leaves and add additional branding. Distillation of buchu also happens within close proximity to the producing sites and comprehensive testing of the active ingredients of each batch of essential oil occurs to determine the chemical distribution of active ingredients and to ensure quality control is maintained. The raw oil is then either packaged on site for sale or is sold in bulk to merchants from the flavour and fragrance industry and used as an additive in final products. Some processors are producers themselves, while others purchase raw material from neighbouring communities and farms or from wild harvesting activities.

Users are defined as those that consume buchu in its raw state or those that purchase products that contain buchu. These range from those in the immediate communities that might harvest and dry leaves themselves for tea, domestic consumers that purchase buchu products from retail outlets, as well as international buyers that purchase exported products. Close to 90 percent of the buchu is consumed by overseas markets (Triumph, 2004).

4.3.3 Regulators

Regulators involved in the buchu value chain include representatives from governmental departments the DFFE, DEADP, the national conservation authority SANParks, and the Western Cape provincial conservation authority CapeNature. These individuals are all involved in one aspect of the regulatory framework as it pertains to conservation and sustainable use of IBR. Details and responsibilities of these regulators are provided in Section 2.4.1, above.

4.3.4 Parastatals

Parastatals involved in the buchu value chain include organisational representatives from research organisation SANBI. Specifically, SANBI assists with facilitating research into biodiversity and acts as an advisor to policy formation. Further, SANBI assists with biodiversity conservation through its ex situ botanical and zoological gardens.

The commercialisation of buchu and those participants in the value chain are all responsible parties when it comes to the evolution of the market as well as the impact expansion may have on the native environment and species existence itself.

Chapter 5: Conservation and Sustainable Use in the Buchu Sector

5.1 Interpretation of Concepts

To begin to understand what type of role those involved in the buchu value chain could play in conservation, I sought to determine how participants interpret and perceive the concepts of biodiversity, conservation, and sustainable use.

All participants interviewed were well-versed in describing biodiversity in line with the definition provided by the CBD (Section 2.1). This presents a contrast to the literature stating that the interpretation of biodiversity as a concept is limited and is typically focused on the simple existence of plants, as opposed to a concept that encapsulates ecosystem functioning and conservation efforts (Wilhelm-Rechmann and Cowling, 2010, Levé et al., 2019). Two emergent themes coming from those across the value chain included: the interconnectedness between humans and their environment, and the responsibility of humans to ensure ecosystems and the species within them are maintained. (Buyer D, Processor E, Government Regulator A).

When asked to comment on their interpretation of the concept of conservation, however, the participants' positions within the value-chain impacted their responses. Producers and processors involved in cultivation activities interpreted conservation as the preservation of wild areas. Alternatively, community members from Elandskloof interpreted the concept of conservation as something more closely aligned with sustainable use, a process that is not detrimental to the environment, where future generations are able to benefit from how biodiversity contributes to providing a clean-living environment and to sustaining and supporting human life through the provision of medicines, fresh water, healthy soils, and raw materials for medicinal plants.

Other processors, buyers, community harvesters, and the government regulator and parastatals, however, highlighted the distinction between preservation and conservation. They noted the need for the creation of preservation areas, natural areas that remain wild and undisturbed by human activity, and for the establishment of conservation areas, where human activities are allowed, but are controlled and managed (Processors A & D, Government Regulator A, Government Parastatal B, Buyer B, Elandskloof Harvester B).

When I asked participants about sustainable use, it was difficult for producers and community harvesters to separate the concept of sustainable use of IBR from the concept of sustainability of their businesses, and these concepts were used interchangeably. For the producers that are dependent on IBR as the main input to their products, sustainability of their business ventures was directly dependent on the availability of IBR. For community harvesters, sustaining future generations was dependent on income generated from buchu industry activities from both wild harvesting and cultivation (Processor A, Elandskloof Harvester A).

Once participants had provided general responses about their understanding of the concepts of biodiversity, conservation, and sustainable use, I probed further about how their own role within the buchu industry fitted into a sustainable use agenda. All sector representatives, from producers and processors to buyers overwhelmingly reported a strong link between sustainable resource use within the buchu industry and the maintenance of biodiversity through conservation. (Processors A, B, & D, Buyers B & C). Participants highlighted how with IBR as the main input into the industry, conservation of that resource is essential. Processor D explained that "biodiversity is having cultivation and the natural environment intertwined and integrated because cultivation is needed in the natural products industry, but we also need to make sure that we aren't doing big monocultures and destroying the natural environment".

5.2 Relationship with Buchu

In exploring participants' roles in CSU, it was important to understand and contextualise the extent of each of their experiences working with buchu and other IBR. With this information it would be possible to better frame how that relationship might impact their interest in CSU activities. To understand the depth of this relationship, I asked participants how many years they had worked with buchu and for the producers, processors, and users what percentage of their businesses or livelihoods were dependent on buchu as a raw material.

It was at this stage of the research that differences began to emerge between participant category classifications. Variations between the importance of sustainable use of buchu as well as individual roles they played in CSU, began to emerge.

Twenty-one of 22 participants reported having worked with buchu for over 5 years, either through harvesting, cultivation, or processing. An overwhelming majority of the participants (17/22, 77%) reported having worked with buchu for more than 15 years. Of the producers, processors, and users,

12/18 (66.6%) specified that buchu was only one of many IBR they work with and comprised less than 10 percent of their business or earnings livelihoods. Three of 18 (16.6%) stated it made up 26-50 percent, and another three (16.6%) reported that it comprised over 75 percent of their businesses or associated livelihood support.

Differences emerged between how producers and processors viewed their roles in conservation and sustainable use as opposed to resource buyers. Producers and processors expressed a passion for working with buchu and exhibited discontent and even despair when posed with the idea that if not protected, it could disappear from the landscape. In contrast, buyers that were further removed from activities taking place on the land itself expressed less concern in terms of the continued existence of buchu. One international buyer explained that, while their preference was to continue buying natural products like buchu, if any of the associated processes for permits became too bureaucratic or otherwise difficult, they would simply turn to synthetic alternatives to supply ingredients for their products (Buyer D). This attitude was similar when participants discussed their current and potential roles in conservation. Producers and processors believed it was essential to be involved in CSU, while buyers believed that it was the sole responsibility of the producers to protect the species.

One processor shared:

> "I have a family history in buchu. My great grandfather exported buchu leaves to Europe and America from the 1920s. My father started distilling buchu oil in the 1970s. He was one of the first to start in South Africa. He began to export buchu oil from South Africa as opposed to buchu leaves. I grew up riding on the back of bales of buchu on the bakkie[1] since I was a small child…I am absolutely passionate about fynbos." (Processor A)

The farm manager expressed sadness with the idea of buchu disappearing from the landscape, "Yes, I have been involved with buchu for decades. It is almost like raising a child…" When asked about their relationship with buchu, they explain,

> "I feel strongly about buchu because it is in my blood… I started with buchu back in 2000 and it has been 22 years. I have experience [with it] because I always watch how we work when we plant, cut, or harvest. I look at the differences every year and that is why I can also teach other people [about it] …then I can explain to them why and how and what happens when you do it incorrectly. Buchu will multiply if you do it correctly, but it will eradicate if you do it incorrectly. Look, buchu is in my blood – I talk about buchu and it makes me feel – I am sorry, it is who I am." (Large-scale Farm Manager)

[1] "Bakkie" is a South African term for a small truck that is used to carry goods in an open boot.

One community harvester also expresses sadness at the thought of buchu disappearing from the landscape,

> "It would be a disappointment to me [if it disappeared] because we've come a long way with buchu and the buchu has always been there. Even if there's a fire, then you will see that the buchu grows nicely again. It is a thing that goes on and on. So, we have to conserve it for our children and grandchildren so that we can show them what buchu is. You must respect it. It's not just any little plant." (Elandskloof Harvester C)

Amidst the discussions of the relationships with buchu, themes emerged about how the traditional use of buchu as a tea still plays a part of the everyday lives of those from the Elandskloof community.

> "You cut so that you have enough to make a pot of herbs in winter. That is how we were taught back in the day. If the fire is burning and there's boiling water on the stove, then your pot of herbs is on the side, and you drink from it. That's why people did not get as sick back then." (Elandskloof Harvester A)

5.3 Wild harvesting of buchu

Wild harvesting of buchu consists of harvesting of wild populations of buchu from steep mountain slopes where the bushes grow interspersed with other types of fynbos vegetation. The process of wild harvesting requires harvesters to trek high into remote areas to locate buchu plants. Buchu plants grow alone and are not found in groups or stands, which is challenging for harvesting teams. Wild harvesting of buchu is not legally permitted within nature reserves but is rather done on privately owned land owned by single family farmers or small farm cooperatives. Anyone wishing to legally harvest buchu from the wild has put in place an agreement with a private landowner to access and harvest wild buchu on their land. In the case of harvesting from communal lands, individuals must apply for permits to the communal property associations to gain access and rights to harvest from communal land. In the Western Cape, the existence of communal lands where buchu is endemic is scarce, thus wild harvesting contributes to a relatively small portion of the market. Buchu processors, buyers and a large-scale farm owner indicate that overall percentages of wild harvesting stocks have shrunk to make up only approximately 10-20 percent of the essential oils market due in part to the increasing costs of transport and labour from wild harvesting locations as

well as the year-on-year production volume variability within the wild harvesting market (Processors A & F, Buyer A, Large-scale Farm Owner A).

Figure 7. Buchu (A. betulina) flowers in late spring ***(Photo credit: L Chicken, 2021)***

The ideal time for harvesting is after plants have flowered and seed pods have dropped. Seeds contain high levels of pulegone, which in high levels is toxic if consumed. It is not possible to separate seed pods manually from leaves and stems prior to processing and thus, they are best avoided. The harvesting period generally coincides with the summer months when the region is hot and dry (December through March). Due to the strenuous nature of wild harvesting, some harvesters have indicated their preference to wait to harvest until the first rains have come in the autumn or early winter seasons, despite this being a period of growth (Participant D).

One participant described his experience leading a team of harvesters in the wild:

> "We walk in the veld because you can't drive in the veld. I give instructions before we spread out because there is a difference between the veld buchu and the buchu in the fields. The veld buchu is harder than the buchu in the fields. The veld's buchu's branches don't break as easily. The most important thing to note about veld buchu – and this is why people are against it – is that you may not cut it too low otherwise it will eventually die. Nothing will happen if you cut it at the height that I explain" (Large-scale Farm Manager).

In general, wild harvesting of natural resources has very few barriers to entry and thus researchers as well as study participants believe it holds the potential to provide supplemental income for marginalised and disadvantaged communities without land ownership (Buyer C). Participants from the community of Elandskloof indicated that the supplemental income from buchu serves this purpose.

Participant Q stated,

> "Look, since we were kicked out here, we could not go and study what we wanted to. We could not make money so that our children could go and study. It is a massive loss, but thanks to buchu and whatever, we can use it to let [people] study something that they are interested in. [The aim is] to harvest it properly and to conserve it so that it can go on and on and on".

In a country still struggling with providing access to land and land ownership, wild harvesting affords communities living near IBR the potential to enter into the wild product trade market (Williams and Kepe, 2008, Chen et al., 2016).

5.3.1 Wild Harvesting and Conservation

As a listed protected species (Trinder-Smith and Raimondo, 2016) the harvesting of wild growing buchu requires a permit which allows activities to take place on privately-owned land (see *section 2.5.4*). A consensus around the role of wild harvesting in conservation, remains unclear and while it may lead to opportunities for both social and ecological benefits, the sustainability of wild harvesting remains to be seen (Leão, et al, 2017). At the time of writing, participants involved in harvesting naturally growing flora were required to pay a ZAR 250 fee per annum (CapeNature, 2011). There is no fee for the permitting process for the buying and selling of cultivated flora. Buchu value chain participants with first-hand experience obtaining permits, including community members, indicated that the permitting process itself was straightforward and that the monetary amount required did not pose a barrier for them (Elandskloof Harvesters A & C). Further, the permitting process does not require that any training be completed prior to the harvesting of the species, only that the standard application, which is not species specific, be completed and submitted. Community members from the Elandskloof Village however, indicated that they did receive formal training from CapeNature representatives on site that taught them how to cut buchu in a manner that would ensure continued plant growth, specifically, they were taught how to harvest at the right height from the base of the plant (Elandskloof Harvester A).

Harvesting permits are granted on an annual basis, and there is an attempt to limit the harvest by setting a quota in accordance with the supply. To set the quotas, Cape Nature officials conduct transect walks through the bush of the proposed harvesting locations to determine regrowth rates. Officials can decide to postpone harvesting applications if regrowth has not been sufficient between harvests. In general, quotas are granted every three years according to natural growth rates unless there have been impacts on the plants caused by external extenuating circumstances such as periods of extended drought or recent fire activity. Throughout the interviews conducted with both large- and small-scale buchu cultivators, harvesters, and processors, there was an indication that this practice has indeed been followed (Processor A, Large-scale Farm Owners A & B, Large-scale Farm Manager, Elandskloof Harvesters (A-D). Two small-scale cultivators from the Elandskloof community (A & C) both individually indicated that when they applied for their harvesting permits, they would contact a certain identified representative from CapeNature who would then walk through the specific area of the veld to determine the regrowth of the buchu and then grant a permit accordingly. A quota system is in line with other natural resource industry standards both in South Africa and across the continent (Williams and Kepe, 2008, Tieguhong et al., 2015). In South Africa's fishing

industry, section 14 of the Marine Living Resources Act, 1998 (Act No. 18 of 1998) (MLRA) has set forth a Total Allowable Catch and Total Allowable Effort combined system to limit overfishing (South African Government, 1998), while in Cameroon, the NTFP industry issues annual permits according to assessments of stock supply (Tieguhong et al., 2015).

Responses were varied about the relationship between wild harvesting and conservation. Participants cited the main threats to wild populations as: unsustainable harvesting methods, frequent harvesting, illegal harvesting from protected lands, and harvesting from private land without permits. When discussing illegal harvesting, however, there were disparate beliefs as to how much of this was affecting buchu. While some cited it as a minor threat, others believed that all wild harvesting should be stopped in favour of cultivation.

To harvest sustainably from the wild, Government Regulator A remarked, "we find that the species persists and that they are utilised in such a way that they set flower, set seed, and regenerate through their natural processes just as well as though the action of harvesting had not taken place". This minimal impact approach, however, needs to be taught through implementation of harvesting guidelines, and remains challenging.

One large-scale farmer expressed concern with illegal harvesting due to the harvesting practices. He stated that there are those that are "in the veld illegally to steal plants…they break off large parts because they are in a rush…it goes extinct because the germs enter it and cause it to die." (Large-scale Farm Manager)

Another farmer noted,

> "The biggest problem I have with the poaching is that they take the whole plant. They pull it out of the ground. They don't cut it properly. I think that if I can educate them and say, 'Look, it's my bush, but if you want it just keep it alive for next year for you to cut the same bush…'" (Large-scale Farm Owner B)

Farmers indicated that they have tried to work with authorities to curb the illegal harvesting activities, but that the process has not been particularly successful as engaging with the illegal harvesters has proved challenging.

> "We had two meetings with [Rastafarians] in Clanwilliam. CapeNature was there and we tried to explain to them that we don't want to stop them harvesting, but we want to do it in a sustainable way. They didn't want to talk to us anymore as soon as we asked them for the quantities that

they harvest. We really tried to get the information because we wanted to – not control – but help them with it…allocate some instead of taking the whole bush. It didn't get off the ground because they weren't interested in that… but poaching is definitely a threat." (Large-scale Farm Owner A)

Despite challenges, most of the participants believed that wild harvesting still makes up an important part of the buchu value chain as it has the potential to benefit communities and individuals without land ownership.

"If wild harvesting helps communities earn something it should be encouraged. The problem is, can one ensure that the quality, quantity, and timing is what industry needs? In a nutshell, I suppose both should work hand in hand, to the benefit of both the farmer and to the community who are wild harvesting." (Buyer C)

Despite being involved in the commercialisation of buchu, participants acknowledged the need to exercise caution around harvesting activities and the negative impacts that industry-related activities can have on the surrounding environment. Two specific concerns include over-harvesting and wild seed collection for the purposes of propagation, which could disrupt natural germination processes and in turn, these activities act in opposition to conservation efforts.

Box 1. Perceptions on Wild Harvesting and Conservation

"I will not say that wild collection of buchu is sustainable. Because it's not…It's not economically wise to just go out, harvest wild, put it in a pot, and at the end you have a very varied chemotype and it's not sustainable when you want to go back in the second or third year because the plants are not there or there was a fire or something like that… You need to keep what is good for the human, what is good for the economy, and what is good for the environment all the time." (Buyer B)
"The biggest pressure on buchu… is when you come from outside and you come and take my [wild] buchu's seed. You come and take my [wild] buchu's seed and then you take it away and then you go and plant it [elsewhere]." (Elandskloof Harvester D)
"Preferably, it's best not to harvest from nature and to use cultivated material instead." (Processor E).
"I don't [think wild harvesting contributes to conservation]. Wild harvesting is on private land anyway. We aren't talking about wild harvesting from a nature reserve. You can't harvest from a nature reserve." (Processor A)
"So, wild harvesting can be done well or not so well…" (Buyer A).
"In the past we've learnt that that is the most unsustainable way because there was simply nothing to harvest during drought periods. There is also no buchu to harvest in areas where fires have occurred." (Buyer B)

There is a strong history of buchu wild harvesting in the Elandskloof community with members citing that they were involved in wild harvesting for personal use before they were forcibly removed from the land in 1962. At this time, buchu harvesting was part of the TK of the community, with

sustainable harvesting methods taught, including when to cut, and how high along the stem to cut. Men would walk into the mountains with teams of donkeys which would enable them to transport up to 5-6 bags at a time in contrast to the 1-2 bags a man could carry (Elandskloof Harvester C). When residents returned between 1996 and 1998, they resumed wild harvesting along the mountainsides. Those living higher up in the valley began buchu cultivation at a small scale as they could benefit from the acidic soils. In 2004, 14 small scale farmers began planting buchu following a training session provided by researchers from Stellenbosch University (Elandskloof Harvester A). Currently, buchu is farmed by 8 community members who each received 250m^2 patches in the valley to farm (All Elandskloof Harvesters, in consensus). However, land development has remained stagnant, and the process slow and bureaucratic.

The state of the land within the kloof ranges from undisturbed stands of fynbos on the higher altitudes, to restioid plants and alien vegetation including pine, Australian *Acacia* (black wattle), and *Eucalyptus* along the lower areas of the valley along the riverbeds. One resident commented that he had to cut the slangbos (*Seriphium plumosum*) and restioids to plant buchu in soil that had not been disturbed or altered by previous farming. Other residents have planted buchu at the edges of their property to experiment emulating buchu's natural growth. Other areas where farming had been attempted, failed, as the land had been previously transformed due to commercial farming, altering the soil quality (Elandskloof Harvester E). In the Elandskloof community, the land is owned communally by the Elandskloof Communal Property Association (ECPA), but residents apply to rent the land for farming purposes. At the time of writing, three small-scale cultivators indicated they each had pending applications to the ECPA to expand their buchu farms from 250m^2 to 5 hectares (ha) (Elandskloof Harvesters A-C). Most of the people currently farming buchu applied to rent the land which was previously farmed by their parents prior to the resettlement. Soil testing took place to determine whether the land was viable to plant buchu. Those that cultivate are also a part of the wild harvesting activities and there is a communal permit granted to harvest from the mountain sides surrounding the valley (All Small-scale cultivators). One resident cites that the profits from the harvesting activities "uplift us as a community" (Elandskloof Harvester A).

5.4 Cultivation of Buchu

Cultivation becomes a suitable option to reduce pressure on wild populations as the current market demand exceeds the supply possible through wild harvesting methods (Van Wyk and Prinsloo, 2018). Further, introducing cultivation reduces the pressure on wild harvested varieties as demands

can be met without disturbing wild locations (Schippmann et al., 2002). The natural products market is notoriously volatile; inconsistent annual yields make products less desirable (Prathapan and Rajan, 2011). When cultivating medicinal plants, farmers control growing conditions of their plants by introducing growth stimulants such as irrigation and an optimised planting location. The result is a stable yield with less variability between seasons, and in certain cases, an extension of the plant's natural period of growth. Any added consistency in plant yields encourages the establishment of, and increase in, market demand for raw materials and secondary value-added products (Hamilton, 2004, Xaba et al., 2009). Cultivation introduces the ability to select specific plant traits and to control for active ingredients caused by species variability, resulting in more consistent products that can be consistently and easily certified (Schippmann et al., 2002).

Beginning in the early 2000s, following the successful application of new agricultural technologies, cultivated buchu began to contribute to most of the market supplies (Xaba et al., 2009). The cultivation of *A. betulina* has been limited to the Western Cape region where the plant is endemic due to its demand for the right balance of moisture and soil acidity levels. Attempts to cultivate it outside of the Cape region have been unsuccessful as replicating the climatic and soil conditions has not been possible and documented cases have shown plants to be prone to fungal infection (Triumph Venture Capital (Pty) Limited, 2004). Despite efforts, throughout the early 2000s, cultivation of the species remained challenging. By the end of the decade, however, research had been completed by SANBI, resulting in successful propagation (Xaba et al., 2009). Shortly thereafter, in 2011, the Department of Agriculture released a guideline outlining best practices for buchu cultivation and harvesting (Department of Agriculture Forestry and Fisheries, 2011). This remains the most up to date industry standard set of guidelines for the species.

Propagation is best done from seed as opposed to from cuttings (Department of Agriculture Forestry and Fisheries, 2011). Due to their soil preferences, seeds have a higher success rate when they are collected from wild buchu plants near to cultivated locations (Department of Agriculture Forestry and Fisheries, 2011). Seedlings develop a longer taproot which allows them to withstand longer periods of low to no rainfall. Cultivated buchu is often irrigated to improve yields, and waterwise methods of drip irrigation once per week is recommended practice (Department of Agriculture Forestry and Fisheries, 2011; Industry Representative 1, Industry Representative 3). The control of weeds is best done manually as the root systems are delicate and can be damaged by heavy machinery. Cultivated buchu plants have a softer stem as compared to wild individuals as they are

irrigated and composted (Large-scale Farm Manager). Figures 8 and 9 depict cultivated buchu plants in late summer (March). In Figure 10, new growth of the harvested plant is visible and is indicative of an early seasonal rain which has stimulated a period of growth. Overall, the main challenge with successfully cultivating buchu is in establishing the right soil conditions in transformed areas. Buchu harvesting from cultivated varieties takes place once a year after the plants have finished flowering. Buchu cultivation does not incorporate the use of industrial fertilisers, because soils, and in turn plants, do not respond well. Cultivated buchu is harvested once a year and farmers aim to harvest at the same time per year to maximize profitability (Industry Representative 1).

Approximately 300 ha of buchu is cultivated across the Western Cape (Processor B). An estimated 2-3 tons of *A. betulina* and 4-5 tons of *A. crenulate* wet vegetation can be harvested per ha (Muller, 2015). In cultivated plantations, yields between the two species are similar at 3-4 tons/ha (Department of Agriculture Forestry and Fisheries, 2011). The buchu industry is considered small with only an estimated 500 tons of wet vegetation produced annually in South Africa (Berliner et al., 2020)(Industry Representative 2), however this volume is up from 2003 estimated production volumes of just 150 tons and an estimated industry value of ZAR 20 million (Triumph Venture Capital (Pty) Limited, 2004).

Figure 8. Cultivated buchu (A. betulina) Citrusdal, Western Cape *(Photo credit: C Baard, 2022)*

Figure 9. Cultivated buchu plant (A. betulina) depicting early growth (Photo credit: C Baard, 2022)

Figure 10. Cultivating tools Citrusdal, Western Cape *(Photo credit: C Baard, 2022)*

Figure 11. Harvesting cultivated land (Photo credit: L Chicken, Skimmelberg, Ltd., 2021)

Figure 12. Cultivated field during harvesting (Photo credit: L Chicken, Skimmelberg, Ltd., 2021)

Figure 13. Harvested buchu (*Photo credit: C Baard, 2022)*

Figure 14. Buchu distillery (Photo credit: C Baard, 2022)

Figure 15. Buchu distillery (Photo credit: C Baard, 2022)

5.4.1 Cultivation and Conservation

Buchu value chain participants are poised to play an important role in conservation and land use management across the Cederberg region. While buchu is a relatively small industry, its activities take place within and adjacent to a fragile environment that is threatened by encroachment by other farming industries, including the conversion of land in favour of viticulture plantations (Fairbanks et al., 2004). To decrease the pressure on harvesting volumes from wild stands of buchu, the Department of Agriculture began to encourage buchu cultivation as a method to meet the increased demand for product derivatives. Currently, cultivated buchu makes up approximately 80% of the raw material entering the domestically produced oil market (Processor A, Processor C).

During the interview process, I asked participants to engage with the question about what their role in conservation is as it relates to their work with the buchu sector. This question aimed to elucidate whether participants considered themselves to be a part of conservation efforts, or whether they felt disassociated from them.

Some individuals believed strongly in playing a role in conservation efforts across the Cederberg. Some examples of their current engagement included: participating in conservation stewardship agreements, preserving sections of their private land, working with local conservation authorities to establish private nature reserves, conducting sustainable wild harvesting trainings, monitoring harvesting activities on communally owned land and reporting illegal acts, clearing alien vegetation, implementing water-wise strategies for limiting water-use, and limiting or eliminating pesticide and herbicide usage and associated runoff.

One processor responded,

> "Based on efforts, I consider our own farm a conservation project – it's not an official one, but it is one that we are actively caring for, particularly the fynbos section in terms of removing alien vegetation, conserving water, and being certified organic. We are looking after a very beautiful piece of land. Every week we have a team of people who eradicate aliens on the farm" (Processor B).

A farm owner spoke about the active role they played in clearing alien vegetation from their farm as well as from adjacent farms and even using cut aliens for their wood burning buchu distillation process (Large-scale Farm Owner B). Another stated that through integration of proteas and native

species into the landscape they encouraged natural biodiversity across transformed farming landscapes.

Some participants believed that they didn't play a current role in conservation. However, as one individual began to describe their activities on their farm, it became clear that they were involved quite actively in conservation efforts, albeit on a small scale. This disassociation of their actions being part of a conservation agenda suggests that further education and engagement with value chain participants on the definition of conservation would be beneficial.

> "I wouldn't say that we're part of any conservation projects, except for the farm -which is a 30ha farm where only 4 ha are cultivated, and the rest is natural fynbos. We clear alien vegetation and encourage the natural fynbos to come back" (Processor D).

Processor C indicated that they participate directly in conservation efforts for the region by working closely with CapeNature, the governing body in the province, on management of their privately-owned land.

> "For us, they are a very important element in the stakeholder environment because they need to protect/ conserve and enforce certain rules and regulations. Working in conjunction with them, it's important that us as an industry are up to date with what they're doing and vice versa. I'm not a proponent of wild harvesting in any conservation area or nature reserve. Personally, I'm all hands off in nature reserves – be it flowers, indigenous material, or whatever the case may be. If you're a private landowner, it's your prerogative to decide, but then it should be done in a sustainable/ proper way. We have teams that harvest for various customers that supply us. Those guys have done it for years and know exactly how to cut and what to do or what not to do".

Some participants felt that the way to encourage conservation of natural areas was to focus on cultivation. Farmers both at the large and small-scale both cited the importance of implementing sustainable harvesting and farming methodologies. One small-scale community cultivator indicated that the monetary benefits gained through employing cultivation had enabled them to reduce their dependence on mountain buchu, and allowed them to harvest less frequently from the wild areas, enabling seed release and germination to occur naturally (Elandskloof Harvester C)

One buyer believed, "the only way that I see how biodiversity will be preserved and conserved if it is cultivated. It won't go extinct if it is cultivated…If you cultivate you also conserve" (Buyer B).

Processor B believed that cultivation of buchu,

> "Contribut[es] to conservation [in] that the longevity of the crop is quite long – we're not talking about a very quick fruition. It's not something that you plant every year. You probably plant once,

> keep the fields, replace any dead plants and then you can work with it for 10, 15, to 20 years. Our neighbour is harvesting from plants that were [planted] in the 1960s. From that point of view, the disturbance of the soil's life is minimal and can be minimalised compared to conventional agriculture… If I compare buchu farming and organic buchu farming with wheat farming here in the Western Cape, then I would think that is a very strong contribution to conservation. [Further], it can contribute in the sense that you take the pressure off of the wild harvesting".

The promotion of cultivation activities alone, even of indigenous species, however, does not automatically take into consideration the effect a cultivated monoculture or expansion can have on natural fynbos ecosystems. In 2003, it was estimated that cultivation for agriculture had already transformed 25.9 percent of the CFR, a trend that was poised to continue (Rouget et al., 2003. Habitats that are susceptible to this continued expansion of human activities, including those adjacent to existing transformed areas or those where the activities are already present, should be a priority for conservation (Rouget et al., 2003). Looking back at the landscape of the Cederberg region in Figure 3, there are many areas within the Cederberg that would meet this definition of being a priority for conservation. Further, agriculture remains one of leading causes of biodiversity loss and land degradation (Bossio et al., 2010, Foley et al, 2005).

From an ecological perspective, the reliance on cultivated varieties encourages the dependency on a genetically homogenous species of plant, which can introduce its own set of challenges, including vulnerability to pests and parasites (Van Wyk and Prinsloo, 2018). In some cases, it has been found that cultivated varieties do not contain the potency of active ingredients found in wild varietals (Schippmann et al., 2002). Processor A believed that cultivation does not ultimately contribute to conservation due to the requirement for agricultural expansion, regardless of the product under cultivation. As cultivated buchu is planted on steep slopes next to native and untouched fynbos landscapes, an expansion of cultivation activities has the potential to negatively impact natural ecosystem functioning. When asked about the expansion of cultivation, one processor acknowledged,

> "You can't rip up your whole farm to plant buchu because it's totally unsustainable, never mind the landscape, but for your own business model as well…if everybody were to suddenly plant hectares and hectares of buchu there will be a market crash and the price will fall into the ground and it will all be pointless…over supply and then everyone suffers." (Processor A)

That same processor indicated,

> "I suspect farmers – probably rooibos farmers – would edge into natural landscapes because these are naturally occurring species that want the natural soil, but I'm not a farmer and don't know." (Processor A)

In some cases, participants, including producers, processors, and users, did not speak about the impact the expansion of buchu plantations have on the natural landscape. They highlighted that they believed growing buchu had much less of a negative impact on land and soil quality and was less of a threat to conservation as compared to other local industries such as the wheat, citrus, and viticulture industries which required soil tilling, the use of pesticides, and extensive irrigation (Processors B & C). When asked what type of vegetation existed on the land before the buchu was planted, only the industry partners, farmers and cultivators that were involved directly in the farming processes knew about the state of the land and whether it was previously transformed (Processors A & C). Large-scale farm owners, knew about the land's history, noting that the areas where they were cultivating buchu had already been previously transformed through commercial farming activities of both non-indigenous species (citrus) and of rooibos (Large-scale Farm Owners A & B, Elandskloof Harvester A). All Elandskloof small-scale cultivators noted that much of the land and soil where buchu was planted had been previously transformed by commercial farming during the middle of the 20th century (Elandskloof Harvesters A-E).

Harvesters and cultivators held knowledge about the role buchu plays in the fynbos ecosystem and valued it intrinsically. They explained how the wild varieties have the strength to adjust to the harshness of local climate and how as a species it is to be revered. The commercialisation of buchu has given it extrinsic value, which has helped to promote its cultivation over other non-endemic species. Without the need for chemical additives, cultivation of buchu within the fynbos landscape ensures the area does not suffer from negative by-products resulting from other agricultural activities which could compete for land in the area. Buchu's inherent sensitivity ensures that its industry partners engage directly in conservation efforts by limiting the encroachment of alien species that could otherwise affect success of its growth through choking waterways and altering soil properties.

Participants suggested various ways in which they believed they could become a part of conservation efforts and promote the sustainable use of buchu through supporting the following activities: ending wild harvesting; encouraging farmers to dedicate a portion of their land to a conservancy; and establishing a buchu industry best practice set of harvesting guidelines for both

wild harvesting and cultivation, incorporating local harvesting knowledge written at a widely understood reading level. This set of guidelines could be used to train new entrants to the market at the time a permit application is submitted for a harvesting or cultivation. A buyer indicated that they wanted more support from the Department of Agriculture for training in the establishment of endemic and indigenous species as compared to the promotion and focus on exotic non-native species (Buyer B). Elandskloof members involved in both wild harvesting and small-scale cultivation, suggested that to encourage sustainable use, they could be involved in the establishment of an *ex-situ* buchu nursery germination project. By involving the community in a nursery, they could personally benefit through income generation while simultaneously encouraging agriculture with indigenous plants.

> "We could have harvested the seeds and germinated the seeds locally ourselves instead of taking the seed somewhere else and then bringing back the seedlings…it will serve as job creation for those who do not work." (Elandskloof Harvester A)

Sustainable use of buchu was a concept that, as previously mentioned, was paramount to all those involved in the industry. Each participant understood how valuable it was to ensure sustainable use of buchu as most had experienced detrimental effects when an oversupply flooded the market and caused prices to plummet. Participants suggested ways in which they believed promoting the sustainable use of buchu could be achieved, including: conducting education campaigns about biodiversity management suitable for local communities involved in small-scale cultivation and harvesting operations; creating accessible boilerplate guidelines for sustainable harvesting; creating sustainable agricultural development guidelines; and determining and distributing literature guiding industry partners and beneficiaries through an ABS negotiation process, discussed below.

5.5 The Future of Access and Benefit-Sharing Agreements

To gain first-hand feedback from participants who had been actively involved in an ABS agreement either currently or in the past, I asked for comments on their personal experiences with the implementation process, and the way in which conservation had featured in these agreements. The level of involvement individuals had with ABS agreements was directly correlated to the role each one played in the value chain: producers and processors had more knowledge of and experience than harvesters that were not directly involved in the establishment of the agreements themselves. Producers and processors who had established ABS agreements shared challenges they faced during the process, suggested ways in which they believed it could be improved, and how they believed conservation-aimed projects might be supported through a parallel or similar agreement.

At the time of the establishment of the first ABS agreements, one processor recalls that representatives from the DFFE contacted them directly to explain to them the need to establish an agreement with a designated beneficiary (Processor E), while a buyer indicated that it was 3 years after the agreements had been put into place (2011) when they were first made aware of the need to establish agreements (Buyer C).

Feedback from the interviews brought insight into the challenges faced with compliance with the ABS regulations. Producers and processors cited concerns about the length of time required to negotiate benefit-sharing agreements and obtain ABS permits. Even government regulators acknowledged that the process is complex and could be improved (Processor B, Government Regulators A & C). Some acknowledged that without streamlining, certain manufacturers may become non-compliant while buyers might consider alternative ingredients that don't need to comply with South Africa's ABS regulations and may thus drop out of the value chain as negotiations can take years (Government Regulator C, Buyer D).

Other challenges with the process included: lack of knowledge of how to begin the process within the South African context, difficulty identifying a designated beneficiary, no reference standards as to where to begin the negotiation process between beneficiaries and industry representatives, no guidance about how to incorporate benefits to conservation into agreements, the overall length of establishing an agreement being up to 7 years (Processor E), and the need for each individual company and beneficiary group to engage in individual agreements with beneficiaries. Further barriers to compliance were indicated as being the limitations of smaller producers and processors to engage in the process due to limited administrative capacity. One government regulator acknowledged that it was currently only the larger contributors in the industry that had current agreements (Government Regulator A).

Box 2. Perceived Challenges with Current ABS Agreements

"Well, there are no guidelines. There are no norms and standards…everything is dealt with on a case-by-case basis. It seems like things change just about every time you put in an application. For example, something might be acceptable the one time and then the next time it is unacceptable – it is as if the goal posts are changing all the time. There has been some progress towards some standardisation, but it is still quite unclear to us what is going to be accepted and what is not going to be accepted

We're often told that there is no recognisable TK holder at present and then there's a condition in the permit stating that you will enter into a benefit sharing agreement with a TK holder should one be identified. It's not really clear how it works if two, three, or four TK holders are identified. Do we need separate agreements for each one? I think you have to have one for each one, but then does the benefit

share get split amongst the four? Most certainly not. The government will probably expect us to pay a percentage four times. I don't know, it's not very clear to us" (Processor D).
"If the government continues to make life difficult, remember it can be replaced with bugs that don't go on strike and that don't want benefit sharing – they just work, day and night. We can go that route, but that's not what we want to do as an industry. We want to conserve biodiversity. We want to get back to the so-called "traditional knowledge holders" and we want to give them benefits for that knowledge, but there's such a barrier at the moment from government to do that" (Buyer C).

A further point of confusion about the ABS process related to the lack of guidelines and awareness of how one could become a recognised TK holder. Elandskloof community members acknowledged that they were not members of either of the two designated beneficiary groups (the NKSC or the SASC), and therefore despite identifying as being descendants of Indigenous groups with associated TK, do not receive benefits from any buchu industry ABS agreements. For the Elandskloof community, their sole benefits come in the form of income generation through their roles as IBR producers.

5.5.1 Conservation as a Beneficiary

Researchers in NTFP policy Laird et al (2010) recommend that to see effective change in conservation, revenue generated by NTFP commercialisation activities should be directed back towards management and conservation of the species or resource itself (Menzies and Li, 2010). To better understand what this might look like within the buchu sector, I asked value chain participants to comment on how they foresee incorporating conservation into a regulated process.

Buyer C suggested that incorporating an element of conservation could be done through the establishment of a monetary fee which could be standardised in all agreements and that they themselves were prepared to "pay a percentage of the value of the material to the TK owners as benefit sharing as well as a percentage to someone who can look after the conservation of that material."

Buyer D believed that any additional compliance that might be required by bioprospectors or biotraders, whether it be for conservation, or otherwise, should simply involve adjustment of current ABS agreements and permits where all aims of the CBD are incorporated and enforced. Existing regulatory authorities, namely the DFFE, were suggested to be the monitoring party, to

ensure that funding collected as part of existing ABS agreements supported the promotion of CSU. Processor D suggested similarly that monetary fees generated by existing ABS agreements should be directed to support already-established conservation groups and associated projects to assist them with achieving their mandate. Processors A and D both suggested that an established conservation organisation such as SANBI or CapeNature should oversee the execution of any associated projects. This, they said, should take the form of a formal partnership, much as the current ABS beneficiaries are Intended to oversee the distribution of income generated through the ABS scheme. These respondents indicated that despite having a general interest in conservation, many industry partners lack both the expertise to implement conservation projects as well as the human resources to do so. As such, despite additional funding being made available to support projects, the challenge of implementing them remains. To gain industry support for the implementation of another fee, an overwhelming agreement amongst value chain participants was that the use of any funding made available through an agreement process must be traceable with outputs being transparent within the sector and to the greater public. To aid in the transparent collection of and even distribution of benefits, sector participants suggested that a national trust fund be established. The promotion of the establishment of a national trust fund has additionally been supported by researchers who had produced guidelines for the DFFE on the incorporation of conservation and sustainable use into access and benefit sharing agreements (Wynberg et al., 2022). The national trust fund touts the ability to be independently managed and monitored and offers a transparency to funding coming in from industry through the agreements.

Chapter 6: DISCUSSION

6.1 Summary of Key Findings

One of the key findings from the research highlights that those involved in the buchu value chain have a good understanding of the concept of biodiversity. This then poses a contrast to the results from research conducted by Wilhelm-Rechmann and Cowling (2010), who found that amongst non-scientists in South Africa, there was a general misunderstanding and misinterpretation of the concepts. Similarly, Levé et al (2019) found that individuals had an institutional approach to defining biodiversity as opposed to a comprehensive ecological understanding. Participants in our study were in support of preservation areas, commenting that spaces where there is an absence of human activity is essential to support ecosystem health, further acknowledging that even if they practice sustainable harvesting, activities of any kind will still impact the environment and cannot be a substitute for wild and untransformed land. While only three participants interviewed stated that buchu comprised a majority of their business and subsequent livelihoods, all the producers and processors expressed a deep interest in the species itself, identifying buchu as a plant that they believe is crucial to protect. Part of this protectionist expression may be because most participants (77 percent) reported having worked with buchu for over 15 years. This awareness and presence and acknowledgement of the surrounding environment shows that those involved in the commercialisation of buchu are well poised to become key participants in conservation and sustainable use (CSU).

6.2 Commercialisation and Conservation

Creating a market for NTFPs has been promoted as a means for conservation efforts to benefit. Through commercialisation, NTFPs are said to be utilised through a “benign” process while simultaneously and inherently, natural areas are protected from alternative destructive exploitive processes (Belcher and Schreckenberg, 2007). This perspective stems from an idea that the value derived from the commercialisation of NTFPs, which can be extracted time and time again, in a manner that is often of low intensity, can thus outweigh the value provided by timber which can only be extracted once, or at best, at very infrequent periods of nearly every two decades (Belcher and Schreckenberg, 2007). In turn, conservation organisations have promoted NTFP commercialisation as an alternative to more destructive land use practices (Belcher and Schreckenberg, 2007). By promoting the use of NTFPs, the use of products from the forest may

expand the values derived from the forest, thus encouraging protection of those areas. While conservation efforts are often limited to providing protection of small patches of land within a wider transformed landscape, profits through commercialisation may make it possible to afford protection across greater areas, thus promoting an ecosystem-based approach to conservation. In turn, the biodiversity within an area may be protected alongside greater ecological and evolutionary processes, both known and unknown (Balmford and Cowling, 2006).

In practice, however, the impact that harvesting of commercialised NTFPs has on conservation is widely influenced by demand and land management. Broadly, the harvesting of NTFPs can either be classified as intensive or extensive, depending on the resource, and depending on its management (Belcher and Schreckenberg, 2007).

In the case of intensive harvesting, demand may exceed the natural replenishing rate of the species, putting increased pressure on the resource, depleting its existence in the wild, and encouraging the expansion of cultivated species. An example of the negative impacts intensive harvesting can have on ecosystems is provided by the palm fruit oil industry. Palm oil, a common ingredient used in cooking, cosmetics, and household detergents, was originally collected from the forest. The rising demand for palm oil during the early 2000s led to the expansion of cultivation activities across Southeast Asia and the Amazon forests of South America (Gutiérrez-Vélez et al., 2011). Natural forests and vegetation have largely been replaced by industrial-scale NTFP plantations where quantities can more easily be controlled and forests intensively managed (Belcher and Schreckenberg, 2007). To this end, palm oil production has largely been blamed for deforestation and biodiversity loss (Vijay et al., 2016). Across the Amazon, between 2000 and 2010, 72% of new plantation activity expanded into previously forested areas, with most of the expansion into those areas (75%) coming from the establishment of high-yield agricultural plantations (Gutiérrez-Vélez et al., 2011). The detrimental effects of the continued expansion of the industry without consideration for biodiversity exemplifies how NTFP commodification can be at odds with conservation efforts.

Within the buchu industry, the promotion of cultivation as a supplement to wild harvesting to meet increased global demand has resulted in more stable pricing and a more consistent year-on market for the product (Van Wyk and Prinsloo, 2018). Due to buchu's ecological fragility and extreme endemicity, however, the expansion of the cultivation activities has most often taken place at the top edges of existing farmland where the slopes are too steep for other cultivating activities to take

place. This has resulted in the encroachment of cultivation activities into naturally occurring biodiverse fynbos landscapes.

In contrast to the expansion of palm oil plantations, there are examples of how the promotion of NTFP commercialisation can contribute to biodiversity when managed sustainably and extensively. While initially harvested from the wild, *Dacryodes edulis,* or safou, a fruit rich in oils and used for found in the forests of west Africa, has been cultivated in an extensive manner in Cameroon (Schreckenberg et al., 2002, Rimlinger et al., 2019). The approach taken with cultivating safou has been to plant it in and amongst other species of trees, providing shade in savannah landscapes for commodity crops such as cocoa and coffee, and affording the ability of safou trees to be an integral part of a multi-level forestry system providing both economic and ecological benefits (Schreckenberg et al., 2002, Rimlinger et al., 2019). Because fruits are larger on the cultivated plantations, safou harvesting activities have now been diverted from wild areas.

The current practices of buchu cultivation exhibit qualities that more closely align with CSU and extensive harvesting, partially due to a concerted effort by those involved in the value chain but are largely influenced by the particularities of the species, its limited geographical distribution, and its inherent sensitivity. The negative effect of encroachment is somewhat mitigated by the fact that buchu cultivation doesn't required an intensive farming approach. Buchu does not lend itself to being subjected to heavy machinery due to its fragile root system, therefore weeding activities are done manually, keeping adjacent areas in-tact, and ensuring that there is minimal negative impact on the soils themselves. Further, buchu's soil preferences ensure that fertilisers and pesticides cannot be used, inadvertently protecting associated un-transformed adjacent areas that might otherwise be affected by chemical runoff. It is these low-impact aspects of buchu cultivation that support the idea that contributors to the buchu value chain can be considered well positioned to work within the parameters of CSU.

6.3 The Roles of Buchu Value Chain Participants in Conservation

Figure 16 displays the roles and responsibilities of each category of participant as they might, within their role, work to implement CSU within the buchu industry. The figure was influenced by results from the literature review and the semi-structured interviews. It takes into consideration each individual's role within the industry and how that may create limitations. The figure builds upon the

value chain figure which provided a visual representation of those within the value chain and their relationships (Figure 6).

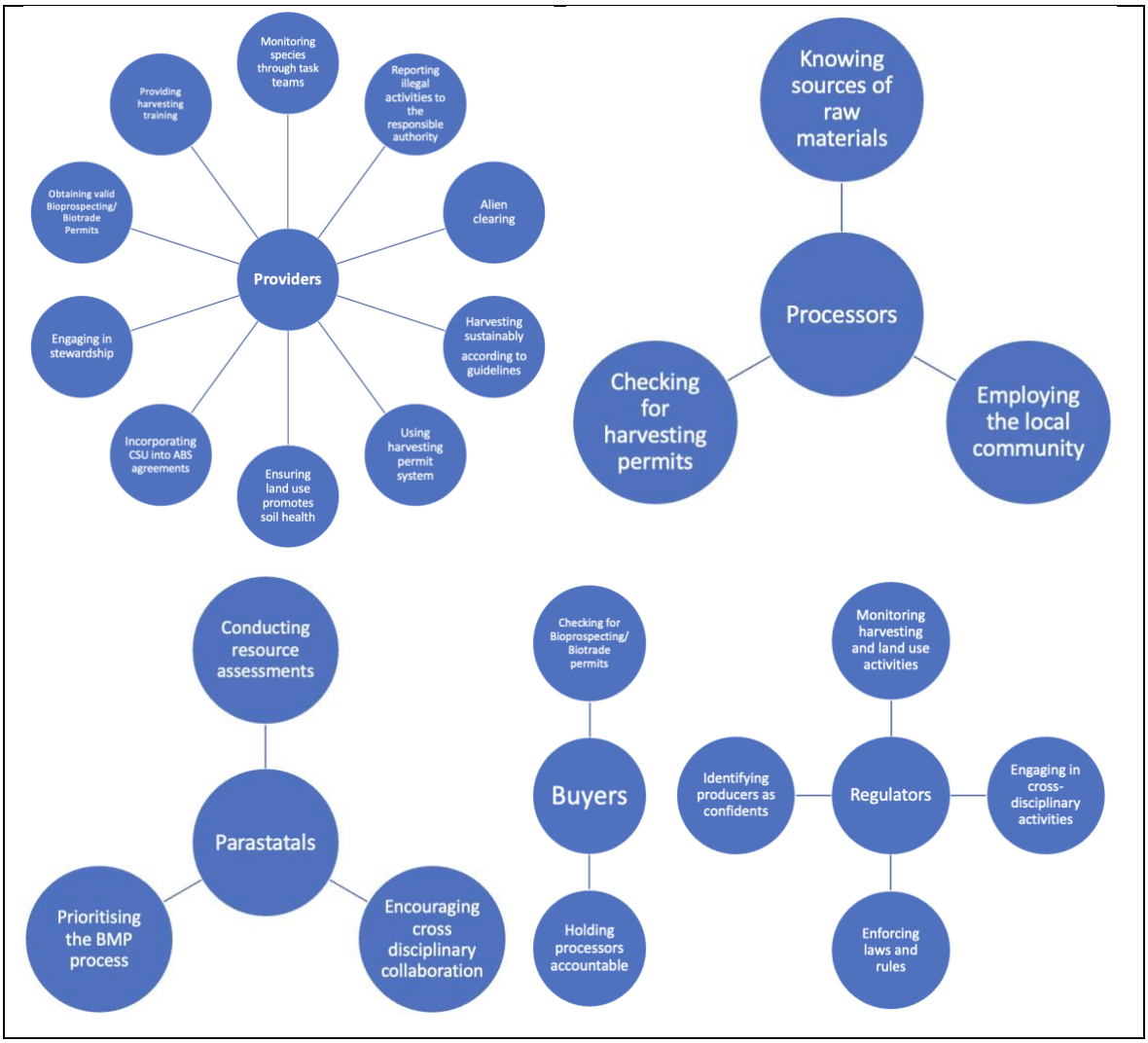

Figure 16. The Roles of Buchu Value Chain Participants in Conservation

The category of providers in Figure 16 includes both the landowners as well as the harvesters that are involved in both wild harvesting and cultivation activities. It also extends to those that may perform these activities on communally owned land where agricultural activities are permitted, with approval and those that use the land for wild harvesting and cultivation activities. Regardless of land ownership, providers can engage in many of the same conservation activities, including monitoring of species, reporting of illegal activities including poaching, harvesting sustainably and according to best practices, obtaining the correct permits (and maintaining the validity of these permits across seasons), and ensuring that cultivation activities promote soil health. Providers that are landowners are also poised to engage through incorporating CSU into their ABS agreements, as well as by conducting trainings with their farm workers and harvesters to ensure that those harvesting from

their land (both from cultivated and wild areas) are adhering to basic harvesting guidelines and parameters in line with sustainable best practices.

Processors are positioned to engage more with their raw material suppliers by making them accountable for their resource abstraction. A way in which to achieve this is through checking for valid permits that are applicable to the harvest of the material they process, including both bioprospecting and biotrade permits as well as any applicable harvesting permits. Once there is accountability created at one level removed from the producer level, poaching/ illegal harvesting could be discouraged as harvesters will not be able to sell raw materials to processors without the necessary permits. Sustainability of the processing activities could be supported through utilising the local community as a source of labour for the processing activities.

Parastatals could become more engaged with different stakeholders and a variety of members of the value chain through their research activities if they begin to look at employing a cross-disciplinary approach. Engaging with industry participants such as the providers and processors could encourage more individuals to engage in activities, such as conducting a more extensive and accurate resource assessment and providing vital information comprising a BMP for buchu.

As with the parastatals, regulators could benefit from working in a cross-disciplinary manner with other industry participants. Collaborating with the producers and the processors would enable them to see what resources exist within communities, affording them the ability to extend regulatory management activities to include under-resourced activities such as the on-the-ground monitoring that is already in place.

Finally, buyers can contribute to conservation through creating and requiring transparency with all of those that they engage with along the value chain. To do this, buyers can educate themselves on the local laws and regulations so that they understand what regulations exist within the South African context, and those that apply to their processors and providers. From there, they can create accountability with their constituents within the industry to demand to see valid permits as the processors have done, thereby continuing the trend of transparency and accountability further up the value chain and ensuring still that no illegal trade is occurring at that level.

Throughout the interviews it was apparent that value chain members were only taking care of their own responsibilities and had established a level of trust with those they were working with. However, this meant that there was no accountability between the levels of the value chain, and that left the industry open to access by illegal activities and non-compliant participants.

The variety of roles and responsibilities that can be exercised by individuals throughout the value chain provides support for the argument that a cross disciplinary approach can be used to support conservation.

6.4 A Cross Disciplinary Approach to Conservation

The commercialisation of buchu with its unique status as an NTFP endemic to a small area within South Africa, has grown in a way where all steps within the value chain from growing and harvesting, through to distilling and manufacturing, occur at primarily at the local or regional level. This translates to explaining why many across the value chain possess a comprehensive understanding of the landscape in which buchu grows, and in turn, possess an inherent affinity for that landscape and its protection. The value chain participants represent a cross disciplinary set of individuals that are working within the same industry and possess the abilities to affect many aspects of the industry's development, including how commercialisation activities impact the surrounding natural landscapes.

Global research provides evidence to support cross-disciplinary or multidisciplinary approaches to effective conservation implementation and biodiversity management (Balmford and Cowling, 2006, Browne et al., 2021, Silva and Topf, 2020). Applying a cross-disciplinary approach to conservation works to reconnect a broader range of people with nature, a crucial aspect when working towards combating a resource's overexploitation (Balmford and Cowling, 2006). Furthermore, there are interactions between social, economic, and political structures that all influence the governance of biodiversity conservation (Silva and Topf, 2020). In the buchu industry, producers have significant potential to impact conservation efforts. Engaging producers, including both landholders as well as those who access land for harvesting or cultivate on communal land, is one of the ways in which a cross-disciplinary approach to conservation can be achieved.

From a monetary perspective, the involvement of participants from across a NTFP value chain can provide additional funding towards a conservation agenda, which is often one of the barriers to implementation (Silva and Topf, 2020). Researchers Balmford and Cowling (2006) propose that a

variety of stakeholders must be genuinely engaged throughout the conservation planning process to effect implementation. They believe that conservation is not *only* about biology but relates to people and the choices they make (Balmford and Cowling, 2006). It is in this vein that consideration of sustainable use of natural products (commercialisation) has shown to correlate with effective conservation efforts (Brockington and Wilkie, 2015). Having invested capital in creating a market for an IBR, buchu value chain participants have a vested interest in the sustainability of their main input, the resource itself. As most of the participants in the research (77%) have worked with buchu for over 15 years, this is testament to the investment they have made to create commercial value from the product from farming through to processing and the development of the associated infrastructure. The sustainability of the resource is consequently tightly linked, if not simultaneous to, the sustainability of individuals working within the industry using buchu as their main input.

Reyers et al. (2010) indicate the necessity of engaging in a transdisciplinary approach for conservation implementation and planning, while Balmford and Cowling acknowledge benefits to include "better monitoring and communicating the changing state of nature" (2006, p. 693). Understanding the complexity surrounding conservation implementation is essential to creating an effective agenda that recognises the pressure from other political agendas, most especially socioeconomic development. Wilhelm-Rechmann and Cowling (2010) posit that implementation hinges on biodiversity conservation being a concept that is meaningful with politicians, with politicians overwhelmingly identifying their priority to address social development, whether or not it comes at the cost of the loss of natural environment. To thwart the immediate rejection of conservation in favour of development, the researchers identified the need for a systematic education of decision-makers, what can be considered a cross-disciplinary approach, through effective communication of how conservation *can* occur alongside development (Wilhelm-Rechmann and Cowling, 2010).Silva and Topf (2020) highlight that at the basis of well-being exists a healthy environment, and therefore development and conservation agendas cannot inherently be divorced from one another.

The cross-disciplinary approach to effective implementation of CBC is further illustrated in a systematic review of over sixty intervention case studies, where researchers Waylen et al. (2010) uncovered those interventions incorporating community engagement had a higher probability of success. The categories of outcomes they measured included: attitudinal, behavioural, ecological, and economic. The strongest predictor of positive ecological outcomes was the engagement of

cultural context as measured through shared values with local NGOs. Other predictors of favourable ecological outcomes included cultural engagement by institutions and governments. Further, when communities were given leadership positionality and decision-making was established, cases had higher success in attitudinal, behavioural, and economic outcomes of resource use. Overall, the researchers established that when a community had a clear understanding of conservation, all outcomes were more favourable.

In the context of the buchu industry, the individuals that have been found to have the most knowledge about the state of the land across the Cederberg region are the producers and a select group of parastatals who have researched the region. In this case, these two groups would provide valuable insight into the main threats the area is facing in terms of land use and degradation. An effective cross-disciplinary process in the buchu industry would involve such parastatals and private producers working closely on developing sections of an industry-specific BMP with the regulatory body, DFFE.

Despite the potential for collaboration, challenges to the future of conservation remain as people continue to perceive a disconnect or disassociation between human development and the environment in which they operate or of the role they could play in the implementation of a conservation agenda. There are two main ways that a disassociated sense of place challenges implementation in the buchu industry within the South African context. The belief by most respondents in the research was that the DFFE and government bodies are the ones that are solely responsible for species monitoring activities and for reporting illegal acts associated with the picking, transporting, and selling of flora. While those who owned land or harvested and cultivated from communal land did state being a part of groups looking to ensure all those picking buchu were part of the legal system and in compliance, others including the processors and buyers, believed that this type of surveillance is the responsibility of the government and agencies including the DFFE. The further individuals were from the land, the more likely they were to indicate that responsibilities to protect biodiversity lay with the regulatory authorities. This disassociation from the land is exhibited by two different types of individuals that lived far from the resource: international buyers, and harvesters residing outside of the immediate area. Creating a sense of place would be one of the ways to encourage involvement in the efforts to conserve biodiversity amongst those individuals' expressing indifference. This could be done through shifting the balance of power of marginalised communities (IPBES, 2022), as well as adding accountability at each level within the value chain,

where buyers can, as illustrated in Figure 16, ask their suppliers and processors about the validity of their permits.

6.5 The Social Impacts of Commercialisation

From a social perspective, cultivation remains a somewhat exclusionary practice that has played a "limited role in local livelihoods" historically (Natural Justice, 2021, p.10). Cultivation requires access to agricultural land and land ownership in some form as well as a larger capital investment to purchase seeds, seedlings, and irrigation systems. Despite this, the contribution cultivation activities make in the buchu industry to local job creation supplements other seasonal agricultural activities due to harvesting season times. The cultivation of buchu has afforded farms to employ staff full time throughout the year as they are able to harvest different species at different times of the year, thus making it a very good complement. The promotion of cultivation within the buchu industry has been aimed at commercial farmers and those who can cultivate on communal lands where agricultural activities are permitted. For those individuals without land tenure, that have wanted to become more involved in the value chain itself, rather than simply act as farm workers, wild harvesting remains their only source of access to raw materials. As Figure 1 suggests, this would then support the argument that wild harvesting is more socially inclusive and thus less marginalising, satisfying that element of sustainability, and becoming a powerful tool for the decision-making process (IPBES, 2022). Findings from the research indicate that sustainable use contains elements of being more sustainable but is still largely influenced by the race-based land policies of the past dispossessing individuals of their access to land. This finding is in line with that of the rooibos industry, where land ownership remains a barrier to entry into the market (Wynberg et al., 2017). The move towards more sustainable practices, however, is exemplified by the access that those without land ownership, have to wild harvesting opportunities on privately and communally owned land. There is recognition that wild harvesting is an important part of culture, and therefore provisions for those to obtain permits to harvest that are not prohibitively expensive. In the context of buchu, however, most of the land where it exists naturally, is protected, therefore there is still limited opportunity for those without access to land to conduct legal harvesting opportunities, which inherently limits the number of permits that can be granted.

Chapter 7: CONCLUSION AND FUTURE RESEARCH

This dissertation aimed to contribute to a better understanding of the buchu sector's role in the conservation and sustainable use across a localised area of the Cederberg region. To meet this aim, I had three objectives, the first of which was to investigate, through a literature review, the current conservation-based regulatory frameworks that apply to the South African context from both the international and national levels. I was able to ascertain that through the CBD and Nagoya Protocol at the international level, and the National Environmental Management Biodiversity Act (NEMBA) and Bioprospecting and Access and Benefit-Sharing (BABS) regulations, that apply to the South African context, there are sufficient structures in place to guide effective management of the biodiversity-based economy, and more specifically of the buchu sector. I discovered that the main challenges in this context are not with the laws and regulatory structures, but rather with the effective monitoring and implementation of the laws which have been delegated to conservation agencies at both the national (SANParks) and provincial (CapeNature) level. Monitoring capacity of these two agencies is limited due to challenging terrain and limited resources. Further, few accurate resource assessments and Biodiversity Management Plans (BMPs) exist for species of concern, including for buchu.

My second objective, to determine the role different buchu value chain actors play in conservation, was one that was met through the semi-structured interview process quite effectively. I uncovered domestic actors all expressed a close relationship with the plant, some seeing it for both its intrinsic and extrinsic value, with producers even going so far as to express that nurturing a buchu plant was akin to raising a child or family. All of those involved in the production side of the buchu sector economy expressed a deeper connection with the land and the fynbos landscape, while international buyers, focused on the market value of buchu, saw it as just one of many indigenous or natural products that could be worthy of investment. Those individuals living and working in production, including those farming, harvesting, and manufacturing buchu products, all valued the quality of the land and landscape. They also acknowledged the fragility of the soils, expressed an interest in ensuring longevity of the species, and saw sustainability of the product as synonymous with the sustainability of their livelihoods. Many buchu producers and processors take part in conservation through alien vegetation clearing activities, mitigating the use of harmful pesticides and insecticides, maintaining soil health, and acting as custodians of the land through participation in anti-poaching monitoring and participating in environmental stewardship through putting private land into conservancies. While other producers and processors didn't immediately identify the role

they play in conservation efforts, throughout the interviews, it was apparent that at a small scale, they too were involved in conservation activities such as those mentioned above.

Successful conservation of a keystone species such as *Agathosma betulina* and *Agathosma crenulata* ensures the fynbos landscape itself is cared for and promotes functioning of the entire ecosystem. As with many medicinal plants, the applications for which buchu are used are not unique, thus rendering it ultimately replaceable by another available species or synthetically made alternative. However, all involved in the plant's commercialisation are poised to promote and maintain buchu as their livelihoods depend on it. An overwhelming majority of study participants believed the way of the future was to continue the promotion of cultivation and to limit wild harvesting activities, protecting the greater environment in which it exists, and understanding the value of maintaining genetic diversity. In this sense, the buchu industry itself plays a vital role in conservation and in the future land composition of the Cederberg and its mountainous fynbos habitats.

Finally, the research has enabled me to set forth a list of recommendations about how others involved in the buchu sector can strengthen their role in conservation by assisting with implementation of species monitoring and proper harvesting.

Individuals within the buchu value chain played variable roles within the establishment and execution of ABS agreements. At the time of writing, a set of guidelines on integrating CSU into benefit-sharing agreements was set forth by an interdisciplinary team of researchers and government officials, under the management of an independent organisation from the German Government (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) as a part of the BioInnovation Africa project (for the South African Department of Forestry, Fisheries, and the Environment (DFFE) (Wynberg et al., 2022). The guidelines aimed to establish, for regulators, users, and providers of indigenous biological resources in South Africa, a map of how CSU could be better incorporated into the ABS agreement process. The set of guidelines set forth to further satisfy the first two objectives of the CBD, (to conserve biodiversity, and to promote sustainable use of biodiversity and its components), while still considering the third objective, (to promote fair and equitable sharing of benefits arising from utilisation and commercialisation of genetic biodiversity) (Wynberg et al., 2022).

Expanding the scope of the ABS agreement process to include CSU requires guidance that incorporates the different landscapes from which commercialised genetic material resources derive. The implications for each value chain actor are that they would be required to ensure a clear statement is made as to how they intend to support conservation projects promoting CSU of the GR they rely on. Furthermore, the guidelines suggest that to ensure benefits filter back into conservation, that an independently managed and monitored national trust fund would need to be established or adopted to ensure a transparent throughput of funding. Any individual projects that serve to benefit from the industrial contributions should also come from a pre-approved list that is vetted by relevant conservation authorities with specific knowledge of the landscapes and species (Wynberg et al., 2022). A key to the ultimate successful integration of CSU into benefit-sharing agreements of the guidelines will be to ensure they are broad enough to encapsulate currently commercialised species, yet specific enough to guide all those involved in the value chain through the process as it applies to their setting and context.

In line with these guidelines, recommendations for the buchu industry that have emerged from this research include:

- Industry to pay a percentage of the value of their harvested material to a conservation project or fund that can assist with looking after the conservation of buchu and its landscapes as a part of their access and benefit sharing agreement process
- The need for a comprehensive set of buchu guides tailored towards farmers and harvesters that is distributed to all farmers and farm workers within the Cederberg region and covering the following information: basic ecology, soil preferences, planting, and harvesting techniques as well as permitting processes for buchu that support its sustainable use
- Conducting an up-to-date resource assessment of buchu that is inclusive of private and public, protected, and un-protected land across the region to measure persistent threats more accurately and in a more technical manner, thereby ensuring the conservation status is relevant.

Future research in the buchu industry should support the development of a Biodiversity Management Plan (BMP). In addition to conducting a resource assessment, an overall land assessment could be conducted across the Cederberg region which could involve technical mapping exercises to determine the extent of land transformation. The rates of change within the region could also be explored to then identify most at-risk areas by looking through agricultural land expansion applications as well as using satellite mapping imagery.

These activities would serve to highlight threats to the CFR region and in turn work to benefit the persistence of buchu alongside the other fynbos species in their natural habitats.

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APPENDICES

APPENDIX 1. Informed Consent Form

DEPARTMENT OF ENVIRONMENTAL AND GEOGRAPHICAL SCIENCE
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SOUTH AFRICA

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Informed Voluntary Consent to Participate in Research Study

Project Title: Conducting Conservation: The Role of the Buchu Industry

Invitation to participate, and benefits: You are invited to participate in a research study conducted with buchu harvesters and farmers, buchu industry partners, government agency employees, private land owners, and end consumers. The study aim is to contribute to a better understanding of the role the buchu industry plays in conservation through the exploration of wild harvesting methods, cultivation, and the perceptions of conservation. Through this, the project aims to collect important feedback that can be used to inform a national guideline for how conservation efforts can be embedded into policy for all involved in the buchu industry at different levels with a focus on sustainable best practices. I believe that your experience and relationship with the buchu industry would be a valuable source of information, and hope that by participating you may gain useful knowledge.

Procedures: During this study, you will be asked to participate in an interview process, complete a questionnaire, and walk through areas where you harvest or cultivate buchu with the research team, if applicable.

Recording: We may take photographs and record audio as part of the study. This information will be used to document the harvesting, cultivation, or other industry process and to assist us in better understanding and remembering information you share with us during our interview with you. If you object to photographs or to audio recordings, please indicate below.

Risks: This research is considered minimal risk, however you may feel uncomfortable answering some of the questions during the interview. Your participation is voluntary and any information you share with the research team is confidential. No personal identifying information will be associated with the information you share with us and you can choose to opt out of answering any of the questions we ask you.

Feedback: Anonymised findings from the research will be used in the completion of my Master's Degree thesis and shared with others in an effort to inform a set of national conservation guidelines for buchu industry partners following the completion of the study.

Disclaimer/Withdrawal: Your participation is completely voluntary; you may refuse to participate, and you may withdraw at any time without having to state a reason and without any prejudice or penalty against you. Should you choose to withdraw, the researcher commits not to use any of the information you have provided without your signed consent. Note that the researcher may also withdraw you from the study at any time.

Confidentiality: All information collected in this study will be kept private in that you will not be identified by name or by affiliation to an institution. Confidentiality and anonymity will be maintained as pseudonyms will be used.

What signing this form means: By signing this consent form, or providing your verbal consent, you agree to participate in this research study. The aim, procedures to be used, as well as the potential risks and benefits of your participation have been explained verbally to you in detail, using this form. Refusal to participate in or withdrawal from this study at any time will have no effect on you in any way. You are free to contact me, to ask questions or request further information, at any time during this research.

I agree to participate in this research (tick one box)	☐ Yes	☐ No	_____ (Initials)
I agree to be photographed	☐ Yes	☐ No	_____ (Initials)
I agree to be audio-recorded	☐ Yes	☐ No	_____ (Initials)
I agree to the use of properly anonymized photographs/			

audio recordings/as a part of the researcher's academic thesis ☐ Yes ☐ No _____ (Initials)

_____	_____	_____
Name of Participant	Signature of Participant	Date
_____	_____	_____

APPENDIX 2: English Version Questionnaire

PROJECT TITLE: Conducting Conservation: The Role of the Buchu Industry
INSTITUTION: University of Cape Town, Department of Environmental and Geographical Sciences
RESEARCHER: Ms Cynthia Biddle Baard, MPH

Instructions: Following the completion of the consent process, the researcher will conduct an interview with the participant. Questions are tailored according to the group the participant belongs to.

All information collected during the interview is confidential. Information shared will only be linked to the group that the participant belongs to. All other information will be anonymised before it is shared with anyone outside of the research team.

DEMOGRAPHIC INFORMATION			
1.	NAME (OPTIONAL)		
2.	TODAY'S DATE (DD-MMM-YYYY):	□□-□□□-□□□□	
3.	AFFILIATION/POSITION		
4.	EMPLOYER		
5.	GROUP CATEGORY	1. Buchu Industry Partner 2. ABS Beneficiary 3. National government agency or associated parastatal 4. Provincial government agency or associated parastatal	5. Conservation Group/NGO 6. Harvester 7. Farmer/cultivator

GROUP CATEGORY:	**BUCHU INDUSTRY PARTNER**
BACKGROUND	
1.	I would like to start the interview by learning a bit about you, your company (the company you are representing) and your relationship with products derived from natural sources.
WHAT IS BIOLOGICAL DIVERSITY	
We are interested in learning about your understanding of biological diversity ***Biological diversity**: The variety of life that is found on the Earth as well as habitats in which they live*	
2.	In your own words please explain what biological diversity (biodiversity) means to you.
3.	What is the relevance of biodiversity to your work as a buchu industry partner?
WHAT IS CONSERVATION	
We are interested in learning about your views on conservation ***Conservation:** to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
4.	In your own words please explain what conservation means to you.
5.	Has your understanding of conservation changed over time? If yes, how?
WHAT IS SUSTAINABLE USE	
We would like to understand what "sustainable use" means to you ***Sustainable use:** To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
6.	What does the term "sustainable use" mean to you?
7.	Has your understanding of "sustainable use" changed over time? If yes, please explain.
8.	Does your company have a statement pertaining to sustainable use or related to sustainability? [If yes, obtain copy]
9.	If not, does your company plan to develop a sustainable use statement in the near future?
BUCHU	
We are interested in learning about your knowledge of and relationship with buchu (Agathosma betulina/Agathosma crenulata)	
10.	How long have you worked with buchu? (Number of years)
11.	Which of the following do you feel most closely defines your relationship with buchu? a. I/my family has had a long relationship with buchu harvesting/cultivation b. Buchu is one of many endemic plants that I believe can be productive c. Other:
12.	How much (percentage) of your business relies on the production of products containing buchu? a. Less than 10 percent b. 10-25 percent

	c. 26-50 percent d. 51-75 percent e. More than 75 percent
BUCHU WILD HARVESTING	
13.	Does your buchu supply include species harvested from the wild? *If no, skip to "Buchu cultivation" section*
14.	How much (percentage) of your buchu supply is made up of wild harvested stock?
15.	Do you know the locations where your suppliers (harvesters) harvest? If yes, please describe.
16.	Have you asked your harvesters about their practices; about them being sustainable?
17.	Are you familiar with any guidelines for the wild harvesting of buchu? If yes, please explain them as best as you can.
18.	Have you asked your harvesters about harvesting permits? a. If yes, have you encountered any challenges with obtaining proof of these permits? b. If no, why haven't you asked for any permits? What do you feel the role these permits play in ensuring sustainability?
19.	Has the quality of the buchu you buy from harvesters changed over time? Please describe the changes.
20.	Has the volume of buchu that you buy from harvesters changed over time? Please describe the changes.
21.	Of all of the changes you have described, why do you feel there have been these changes?
22.	Does the wild harvesting process contribute to the sustainable use of buchu?
23.	Does the wild harvesting process contribute to habitat conservation?
BUCHU CULTIVATION	
24.	Does your buchu supply include cultivated species? a. How much (percentage) of your buchu supply is made up of cultivated stock? b. Is the cultivation taking place on your own land? a. How much of your land (hectares) is dedicated to cultivation? b. How long has your farm been cultivating buchu? c. How long has your farm been cultivating other fynbos species/plants? d. Before you began to cultivate buchu, what was the state of the land? (e.g., was it wild fynbos, or was another product farmed on it previously?) c. Do you receive cultivated stock from other farms? a. Do you know the locations of these farms? Please describe. b. Do you know how long these farms have been cultivating buchu? c. If applicable, do you know how long these farms have cultivated other fynbos species?

	d. Do you know anything about the state of the land before cultivation took place on these farms? (e.g., was the land wild fynbos, or were other products farmed on the land previously?)
25.	Does cultivation contribute to the sustainable use of buchu?
26.	Does cultivation contribute to habitat conservation?
IMPACT AND ROLE IN CONSERVATION	
We are interested in learning about your role in conservation and how conservation impacts you	
27.	As an industry representative/company, what role do you believe you play in the conservation and sustainable use of buchu?
28.	Are you currently a part of any conservation projects? Do you have any plans for the future?
29.	What future challenges do you foresee with strengthening of conservation?
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS)	
We are interested in learning whether your company is involved in any ABS agreements (past or present) *NOTE: Explain what ABS is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	
30.	What is your understanding of ABS agreements?
31.	Do you have any ABS agreements in place or in progress for your use of buchu or associated TK?
32.	If yes, please explain some details of the agreement including what provisions you have made for biodiversity conservation, and for economic/ community development.
33.	If you have any ABS agreements in place or in progress, a. Was accessing information about establishing the ABS agreement straightforward? b. What were some of the challenges you faced when establishing the ABS agreement?
34.	Do you think it is important to build a requirement for conservation benefits into ABS agreements? a. If yes, do you have any suggestions about how this could be done in the buchu industry specifically? (Think about the actors and their roles) a. If no, please explain.
35.	What role do you believe institutions (such as the buchu association) play in conservation and sustainable use?
36.	What type of guidelines, guidance or support might be useful to assist you in strengthening the sustainable use of buchu and conservation of associated habitats and ecosystems?

GROUP CATEGORY:	ABS BENEFICIARY
BACKGROUND	
1.	I would like to start the interview by learning a bit about you and your relationship with products derived from natural sources.
WHAT IS BIOLOGICAL DIVERSITY	
We are interested in learning about your understanding of biological diversity ***Biological diversity:*** *The variety of life that is found on the Earth as well as habitats in which they live*	
2.	In your own words please explain what biological diversity (biodiversity) means to you.
3.	Does a biologically diverse landscape impact you? How?
WHAT IS CONSERVATION	
We are interested in learning about your views on conservation ***Conservation:*** *to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
4.	In your own words please explain what conservation means to you.
5.	Has your understanding of conservation changed over time? If yes, how?
WHAT IS SUSTAINABLE USE	
We would like to understand what "sustainable use" means to you ***Sustainable use:*** *To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
6.	What does the term "sustainable use" mean to you?
7.	Has your understanding of "sustainable use" changed over time?
BUCHU	
We are interested in learning about your knowledge of and relationship with buchu (Agathosma betulina/Agathosma crenulata)	
8.	What is your personal relationship with buchu? With other fynbos plants (e.g., rooibos?)
9.	Do you hold any specific knowledge of buchu? (e.g., harvesting, cultivation, preparing for medicinal uses)
10.	If yes, where does your knowledge of buchu come from? (Family e.g., father, grandfather etc.) If there are multiple different sources of knowledge, please list them all.
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS)	
We are interested in learning more about ABS agreements you are involved in (past and present) *NOTE: Explain what ABSA is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	
11.	What is your personal understanding/ interpretation of ABS agreements?
12.	Are you involved in any current or proposed ABS agreements related to buchu?

13.	If yes, please explain some details of the agreement (s) including details of the benefit-sharing, and details of capacity development as it relates to benefit-sharing and conservation.
14.	If you are a part of any ABS agreements, a. Was accessing information about establishing the ABS agreement straightforward? b. What were some of the challenges you faced when establishing the ABS agreement with your industry partner?
15.	Do you think it is important to build a requirement for conservation benefits into ABS agreements? b. If yes, do you have any suggestions about how this could be done in the buchu industry specifically? (Think about the actors and their roles) a. If no, please explain.
GUIDELINES	
We will be working to develop a set of guidelines for benefit sharing for the conservation and sustainable use of biodiversity and would like your input into how these guidelines could work for you	
16.	As a traditional knowledge holder/ ABS beneficiary, what role do you believe you play in the sustainable use and management of buchu?
17.	What type of guidelines, guidance or support might be useful to assist you in strengthening the sustainable use of buchu and conservation of associated habitats and ecosystems?

GROUP CATEGORY:	**NATIONAL/PROVINCIAL GOVERNMENT AGENCY OR PARASTASAL**
BACKGROUND	
1.	I would like to start the interview by learning a bit about you and your organisation's relationship with conservation of natural habitats and landscapes.
WHAT IS BIOLOGICAL DIVERSITY	
We are interested in learning about your understanding of biological diversity and your role ***Biological diversity:*** *The variety of life that is found on the Earth as well as habitats in which they live*	
2.	In your own words please explain what biological diversity (biodiversity) means to you.
3.	Does maintaining biological diversity/a biologically diverse landscape impact you as a National/Provincial Government Agency representative? How?
CONSERVATION	
We are interested in learning about your understanding of and views on conservation ***Conservation:*** *to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
4.	In your own words please explain what conservation means to you.
5.	Has your understanding of conservation changed over time? If yes, how?
6.	How does conservation impact the areas and landscapes your Agency/group manages?
7.	What future challenges do you foresee with the strengthening of conservation?

SUSTAINABLE USE	
We would like to have a discussion with you about "sustainable use" ***Sustainable use:*** *To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
8.	What does the term "sustainable use" mean to you?
9.	Has your understanding of "sustainable use" changed over time?
BUCHU	
We are interested in learning about your knowledge of buchu (Agathosma betulina/Agathosma crenulata)	
10.	What is your knowledge of buchu?
11.	What are your views about the conservation status of buchu?
BUCHU WILD HARVESTING	
12.	What policies or laws apply to the harvesting of buchu?
13.	How do you monitor or implement policies or laws as they apply to buchu harvesting?
14.	What are key challenges you face in managing the use of wild harvested buchu and in land conservation?
BUCHU CULTIVATION	
15.	What policies or laws apply to the cultivation of buchu?
16.	How do you monitor or implement policies or laws as they apply to buchu cultivation?
17.	What are key challenges you face in managing areas where buchu is cultivated?
IMPACT AND ROLE IN CONSERVATION, AND SUSTAINABLE USE	
We are interested in learning about your role in conservation and sustainable use	
18.	As National/Provincial Government Agency representative, what do you believe the Agency's role is in engaging in sustainable use in general, and of buchu or other fynbos plants?
19.	How could buchu conservation and sustainable use be strengthened? What would your role be in achieving this?
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS) see earlier	
We are interested in learning whether you have had any involvement with ABS agreements (past or present) *NOTE: Explain what ABSA is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	
20.	What is your understanding of ABS agreements?
21.	Have you ever been involved in any part of establishing or monitoring an ABS agreement for buchu or any other genetic material in South Africa? a. If yes, please explain some of the details of the role you played in the establishment or monitoring of the contractual portions of the agreement.

	b. If no, are you aware of other Agency representatives that have been involved in this? If yes, could you share their title and contact information?
22.	What role do you think that a conservation NGO should play in the implementation of ABS requirements?
23.	What role do you think that buchu industry partners (companies) should play in the implementation of ABS requirements?
24.	What role do you think that wild harvesters should play in the implementation of ABS requirements?
25.	What role do you think that farmers and cultivators should play in the implementation of ABS requirements?
26.	What do you think that your role should be in the implementation of ABS requirements?

GROUP CATEGORY:	**CONSERVATION GROUP/NGO**
BACKGROUND	
1.	I would like to start the interview by learning a bit about you and the organisation you represent.
ROLE IN BIODIVERSITY	
We are interested in learning about your understanding of biological diversity ***Biological diversity**: The variety of life that is found on the Earth as well as habitats in which they live*	
2.	Does your NGO have a statement about biodiversity protection? [if yes, obtain a copy] a. If so, has this statement changed over time? b. If not, does your NGO plan to develop a biodiversity statement in the near future?
WHAT DOES CONSERVATION MEAN (TO YOU)	
We are interested in learning about what conservation means to you ***Conservation:** to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
3.	In your own words please explain what the concept of conservation means to you
4.	Has your understanding of conservation changed over time? If yes, explain how.
5.	As a conservation NGO do you believe the concept of conservation is marketed accurately towards the following groups: a. Towards the community? b. Towards harvesters? c. Towards farmers/cultivators? d. Towards industry? e. Towards regulatory authorities?
ROLE IN CONSERVATION	
We are interested in learning about your role in conservation	
6.	What is the role that your organisation plays in conservation?

7.	What conservation programmes has your organisation started or been a part of?
8.	What role do you play in influencing the understanding of the concept of conservation amongst these actors (community/industry/regulatory authorities)?
9.	How have your conservation programmes been integrated into community development initiatives?
WHAT IS SUSTAINABLE USE	
We would like to understand what "sustainable use" means to you ***Sustainable use:*** *To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
10.	What does the term "sustainable use" mean to you?
11.	As an NGO, what do you believe your role is in engaging in sustainable use of buchu and other fynbos plants?
12.	Does your NGO have a statement pertaining to sustainable use or related to sustainability? [if yes, obtain copy] c. If so, has this statement changed over time? d. If not, does your NGO plan to develop a sustainable use statement in the near future?
BUCHU	
We are interested in learning about your knowledge of and relationship with buchu (Agathosma betulina/Agathosma crenulata)	
13.	What is your knowledge of buchu? Of other indigenous/natural plants/products (e.g., fynbos, rooibos)?
14.	Are you involved in any projects that impact the conservation of buchu (or the habitats in which buchu is found)?
15.	Are you involved in any projects that impact the conservation of fynbos or other indigenous/natural plants/products?
BUCHU WILD HARVESTING	
16.	What role do you believe wild harvesting of buchu plays in biodiversity conservation?
17.	What is your NGO's role in managing the harvesting of buchu (and other fynbos species/indigenous plants if applicable)?
BUCHU CULTIVATION	
18.	What role do you believe cultivation of buchu plays in biodiversity conservation?
19.	What is your NGO's role related to the management of the cultivation of buchu (and other fynbos species/indigenous plants if applicable)?
20.	What is your NGO's role related to the sale and trade of buchu (and other fynbos species/indigenous plants if applicable)?
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS)	
We are interested in learning whether your company is involved in any ABS agreements (past or present) *NOTE: Explain what ABSA is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	

21.	What is your understanding of ABS agreements?
22.	Have you ever been involved in any part of establishing or monitoring an ABS agreement for buchu or any other genetic material in South Africa? a. If yes, please explain some of the details of the role you played in the establishment or monitoring of the contractual portions of the agreement. b. If no, are you aware of other Agency representatives that have been involved in this? If yes, could you share their title and contact information?
23.	Do you think it is important to build a requirement for conservation benefits into ABS agreements? c. If yes, do you have any suggestions about how this could be done in the buchu industry specifically? (Think about the actors and their roles) d. If no, please explain.

GROUP CATEGORY:	**HARVESTER**
BACKGROUND	
1.	I would like to start the interview by learning a bit about you and how you became a harvester.
WHAT IS CONSERVATION	
We are interested in learning about what conservation means to you ***Conservation:*** *to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
2.	In your own words please explain what conservation means to you.
3.	Has your understanding of conservation changed over time? If yes, how?
RELATIONSHIP WITH CONSERVATION	
We are interested in learning about how conservation impacts you and your landscape	
4.	Please give an example of conservation in the area where you harvest.
5.	How does conservation impact the landscape in which you work?
6.	How does land that becomes conserved impact you as a harvester?
7.	How do you feel you as a harvester play a role in conservation? a. If yes, please explain how you are involved. a. If not, would you be interested in becoming involved in conservation? Please give an example of how you see yourself becoming involved.
WHAT IS SUSTAINABLE USE	
We would like to understand what "sustainable use" means to you ***Sustainable use:*** *To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
8.	What does the term "sustainable use" mean to you?

9.	Has your understanding of "sustainable use" changed over time?
10.	As a harvester, what do you believe your role is in engaging in sustainable use of buchu and other fynbos plants?
BUCHU WILD HARVESTING	
We are interested in learning about your knowledge of and relationship with buchu (Agathosma betulina/Agathosma crenulata)	
11.	What is your personal relationship with buchu?
12.	What type of specific knowledge do *you* hold of buchu? (e.g., harvesting, cultivation, preparing for medicinal uses)
13.	Where does your knowledge of buchu come from? (Family e.g., father, grandfather etc.) If there are multiple different sources of knowledge, please list them all.
14.	Of all of the products you harvest, how much of it is buchu? a. Less than 10% b. 10-25% c. 26-50% d. 51-75% e. More than 75%
15.	Where do you harvest from? (e.g., private land, protected land, any combination of the two)
16.	Please explain the process of harvesting and what methods you use to guide your harvest (when do you harvest, how much do you harvest etc.)
17.	How do you ensure that your harvest is sustainable and that it will allow you to harvest in the future?
18.	What are challenges you face when harvesting buchu?
19.	Have the areas where buchu grows in the wild changed since you (or others you know) started harvesting? What changes have you noticed?
20.	Has the quality of the buchu you harvest changed over time? Please describe the changes.
21.	Has the volume of buchu that you harvest changed over time? Please describe the changes.
22.	Of all of the changes you have described, why do you feel there have been these changes?
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS)	
We are interested in learning whether your company is involved in any ABS agreements (past or present) *NOTE: Explain what ABSA is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	
23.	What is your understanding of ABS agreements?
24.	Do you know of any ABS agreements in place or in progress related to buchu in the area where you harvest? a. If yes, please explain some details of the including what agreements have been made for biodiversity conservation, and for local economic/ community development

GUIDELINES	
We will be working to develop a set of guidelines for benefit sharing for the conservation and sustainable use of biodiversity and would like your input into how these guidelines could work for you	
25.	Are you familiar with any guidelines for the wild harvesting of buchu? a. If yes, please explain them as best as you can.
26.	Is a permit required for you to harvest from the areas where you harvest buchu? b. If yes, have you obtained a permit to harvest from these areas? 1. If yes, have you faced any challenges obtaining these permits? 2. If no, what was the main reason you didn't obtain a permit? 3. What do you feel the role the permits play (in ensuring sustainability)?
27.	What type of guidelines, guidance, or support might be useful to help you harvest sustainably?
28.	If possible, would you be interested in partnering with a conservation NGO that could assist you as a harvester in organising how benefits from an ABS agreement could be distributed?

GROUP CATEGORY:	**FARMER OR CULTIVATOR**
BACKGROUND	
1.	I would like to start the interview by learning a bit about you and how you started cultivating buchu?
WHAT IS CONSERVATION	
We are interested in learning about your views on conservation ***Conservation:*** *to protect species, maintain and restore habitats, enhance ecosystem services, and protect biological diversity.*	
2.	In your own words please explain what conservation means to you.
3.	Please give an example of your understanding of conservation.
4.	Has your understanding of conservation changed over time? If yes, how?
RELATIONSHIP WITH CONSERVATION	
We are interested in learning about how conservation impacts you	
5.	How has conservation impacted the landscape where you farm? (Please give an example)
6.	Do you play a role in conservation in your area currently? a. If yes, please explain how you are involved. b. If not, would you be interested in becoming involved in conservation? Please give an example of how you see yourself becoming involved.
WHAT IS SUSTAINABLE USE	

We would like to understand what "sustainable use" means to you ***Sustainable use:*** *To use a natural resource in a way where it can be replenished at a rate faster than it is used and in a way that does not deplete biological diversity.*	
7.	What does the term "sustainable use" mean to you?
8.	Has your understanding of "sustainable use" changed over time? If yes, how?
9.	As a farmer/cultivator, what do you believe your role is in engaging in sustainable use of buchu and other fynbos plants?
BUCHU CULTIVATION	
We are interested in learning about your knowledge of and relationship with buchu (Agathosma betulina/Agathosma crenulata)	
10.	What is your relationship with buchu?
11.	How many hectares (ha) of land are under cultivation on your farm?
12.	Of all of the products you farm, what percentage does buchu comprise? f. Less than 10% g. 10-25% h. 26-50% i. 51-75% j. More than 75%
13.	How long has *your farm* been involved in the cultivation of buchu?
14.	How long have *you* been involved in the cultivation of buchu? The cultivation of other fynbos/indigenous species (what kinds)?
15.	Before you began to cultivate buchu, what was the state of the land? For example, was it wild fynbos, or was another species farmed on it previously?
16.	Did you need to get any permits to clear your land to plant buchu? Please explain?
17.	In your view, what purpose do these permits serve?
18.	Do you believe cultivation of buchu contributes to sustainable use? How?
KNOWLEDGE OF ACCESS AND BENEFIT SHARING AGREEMENTS (ABS)	
We are interested in learning whether your company is involved in any ABS agreements (past or present) *NOTE: Explain what ABSA is, if necessary or prompted as such: an agreement that proposes fair and equitable sharing of benefits arising from the use of genetic resources, particularly, that holders of indigenous or traditional knowledge are deserving of benefits arising from commercialisation of these resources.*	
19.	What is your understanding of ABS agreements?
20.	Do you know of any ABS agreements in place or in progress related to buchu in the area where you farm/cultivate? a. If yes, please explain some details of the including what agreements have been made for biodiversity conservation, and for local economic/ community development

21.	If you have been involved in any of the ABS agreements in place or in progress, a. Was accessing information about establishing the ABS agreement straightforward? b. What were some of the challenges you faced when establishing the ABS agreement?
GUIDELINES	
We will be working to develop a set of guidelines for benefit sharing for the conservation and sustainable use of biodiversity and would like your input into how these guidelines could work for you	
22.	As a farmer/cultivator, what role do you believe you play in the sustainable use and management of buchu?
23.	What type of guidelines, guidance, or support might be useful to help you cultivate buchu sustainably?