



Biopiracy: Crying wolf or a lever for equity and conservation?

Rachel Wynberg

Department of Environmental and Geographical Science, University of Cape Town, Private Bag, Rondebosch 7700, South Africa

ARTICLE INFO

Keywords:

Access and benefit sharing
Nagoya Protocol
Indigenous peoples
Traditional knowledge
Intellectual property
Innovation

ABSTRACT

Access and benefit sharing (ABS) is a central approach to address biopiracy – the misappropriation of genetic resources and traditional knowledge without consent or compensation, often tied to patenting. Benefit-sharing agreements comprise a core element of ABS and are intended to leverage greater social and economic justice, create incentives for biodiversity conservation, and strengthen the rights of indigenous and local communities. However, emerging evidence suggests otherwise. Through review of four cases of biodiversity commercialization in South Africa – *Hoodia gordonii*, *Aspalathus linearis* (rooibos), *Sceletium tortuosum* (kougoed) and *Pelargonium sidoides*, each with histories of biopiracy charges and associated benefit-sharing agreements, this paper aims to explain this apparent contradiction. The cases reveal that while ABS has succeeded in recognizing holders of traditional knowledge, the wider political and economic struggles faced by communities remain neglected. Power relations and economic disparities have not changed, and control remains vested in land, with ownership remaining highly skewed towards industry partners who have market dominance; and intellectual property, the benefits of which are disassociated from traditional knowledge holders and biodiversity custodians. ABS processes have also led to a clamor for representation, favoring groups that are politically connected, well organized and resourced, while excluding more marginalized groups who are less capacitated. Moreover, despite significant biodiversity concerns in each case, there are few conservation benefits. Such trends, combined with new forms of “digital biopiracy” and opportunities opening through the post 2020 Global Biodiversity Framework, emphasize the need to reconceptualize ABS to leverage more equitable and sustainable outcomes.

1. Introduction

Biopiracy, first coined as a term in the early 1990s, describes the way that corporations or researchers (usually from the global North) misappropriate the genetic resources and traditional knowledge of countries and Indigenous peoples and local communities (usually from the global South) without their consent, and, typically, patent this information to enable knowledge to be enclosed and further commodified for the purpose of profit (Hamilton, 2006; Dutfield, 2009; Robinson, 2010). Over the past 30 years, however, the concept has become something of a broad church, synonymous with unseemly corporate profits, perceived inequities in the division of benefits arising from biodiversity-based commercialization, and the use of biological resources and associated knowledge without consent (Dutfield, 2009; Robinson, 2010).

In its widest sense, biopiracy has taken place for more than 2000 years, through unauthorized plant collections that served to build colonial empires and facilitate the financial prosperity and scientific advancement of Europe and North America, in part responsible for

today's economic inequalities between nations (Crosby, 1972; Kloppenborg, 1988). However, the rapid increase in awareness and the growth of social movements proclaiming the environmental and cultural rights of Indigenous peoples and local communities (Posey and Dutfield, 1996; Lightfoot, 2016), has placed biopiracy in the spotlight over the past three decades, aligning also with the emergence of global intellectual property rules in the 1990s through the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS) of the World Trade Organization. The TRIPS agreement encompassed a global intellectual property rights system for healthcare, food and agriculture and ushered in a new era of privatizing knowledge. In this neoliberal context of “hyperownership” (Safirin, 2004), companies made increasing claims for monopoly control over innovations linked to biodiversity and traditional knowledge, linked to an intensification in patent activity (Dutfield, 2000; Drahos, 2003; Oldham et al., 2013). International policies set in place a market-driven framework for biodiversity use, conservation, and social justice, characterized by the notion of “selling nature to save it” (McAfee, 1999).

Benefit sharing, first articulated as a legal expression by the

E-mail address: Rachel.wynberg@uct.ac.za.

<https://doi.org/10.1016/j.respol.2022.104674>

Received 22 December 2021; Received in revised form 15 October 2022; Accepted 14 November 2022

Available online 24 November 2022

0048-7333/© 2022 The Author. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Convention on Biological Diversity (CBD) in 1992, emerged as a central approach to address biopiracy, and coincided with escalating global concern about biodiversity loss, and changes in science and technology that were opening commercial opportunities for the use of biodiversity in lucrative pharmaceutical, biotechnology, agricultural, personal care, and food industries (ten Kate and Laird, 1999).

In what Gollin (1993) describes as the “Grand Bargain”, where access to biodiversity and associated traditional knowledge of the global South was traded for benefits from the technologically rich industrialized North, the CBD and its 2010 Nagoya Protocol, set in place a new regime to regulate bioprospecting and trade in genetic resources and traditional knowledge. “Users” wishing to access genetic resources, had to provide “fair and equitable benefits” to the country providing these resources. For these benefits to be obtained, a “provider” country had to facilitate access to genetic resources to users, typically companies or researchers from the global North (hence “access and benefit sharing”, ABS) (CBD, 1992; Nagoya Protocol, 2010). This decidedly transactional approach relied on bilateral contracts and benefit-sharing agreements, which were used to negotiate agreements with the “provider” of genetic resources and/or traditional knowledge, which could be a state, an individual, or an Indigenous or local community. Users were now required to get permission from providers before collecting resources and knowledge (“prior informed consent”), mutually agree on the terms of exchange, and share benefits fairly.

Benefit sharing was interpreted widely to go beyond the sharing of revenue to mean the “fair and equitable” division and allocation of both monetary and non-monetary benefits but without specifying how these subjective and almost unmeasurable objectives could be assessed. Monetary benefits were expected to reflect the market value of products commercialized based on genetic resources and biodiversity. Non-monetary benefits were anticipated to include a range of options, including stronger research collaborations and technology transfer between the global North and South, support for conservation, and capacity and skills development. The intention was to bring greater social, environmental, and economic justice to the commercial use of biodiversity, and to contribute towards strengthened rights of Indigenous and local communities and reduced inequalities (Reid et al., 1993). Those advocating for market-based approaches to conservation theorized that the inclusion of conservation benefits in ABS agreements could also help to stem the loss of biodiversity by providing funding for conservation initiatives and biodiversity research (Costanza et al., 1997).

While initially concerned with traditional knowledge and the rights of developing countries over their genetic resources, in the 30 years since adoption of the CBD the world has witnessed dramatic technological changes, with increasing use of biotechnology, synthetic biology and associated commercial applications. Due to a heavy reliance of these technologies on genetic sequence data and information, new forms of “digital biopiracy” (Hammond, 2017; Bond and Scott, 2020) have emerged, typically disassociated from the physical material itself and traditional knowledge holders with no clear sites for consent or benefit sharing (Ruiz Muller, 2015; Kupferschmidt, 2018; Laird et al., 2020). Hammond (2020), for example, lists a range of medicinal and food plants in Genbank, the US genetic sequence database, many drawn on traditional knowledge, with the information openly accessible to database users. Similarly, the way in which genetic sequence data (referred to as digital sequence information, or DSI in policy arenas) is accessed, managed and curated, means that a range of initiatives may side-step benefit-sharing requirements and undermine the rights of Indigenous peoples and local communities (Bond and Scott, 2020; Smyth et al., 2020). Divseek, for example, a project that aims to sequence the genomes of a wide range of crops and wild relatives, has been censured for “facilitating wide-spread biopiracy by providing access to digital sequences of the world’s crop biodiversity without provisions for benefit-sharing” (www.synbiowatch.org/captain-hook-awards-2016/, accessed 14 August 2022).

This exponential use of DSI has coincided with the biodiversity

emergency, raising questions about the role of DSI both as a tool to support biodiversity conservation through deepened knowledge and new applications, and as a conservation funding mechanism (Laird and Wynberg, 2018). In parallel, and to align CBD requirements for prior informed consent and benefit sharing with patent rules, a protracted negotiation process has been underway within the World Intellectual Property Organization (WIPO) to require the obligatory disclosure in patent applications of genetic resources and associated traditional knowledge (Robinson et al., 2017).

This changing institutional, scientific, political, and technological landscape takes place amidst growing concerns about the calcification of the ABS framework, and its contribution towards ethical research and commercialization (Laird et al., 2020). With 196 states members of the CBD and 138 party to its Nagoya Protocol,¹ hundreds of laws and policies are now in place globally to give effect to these international norms. A central requirement is for benefit-sharing agreements to be in place before permits are issued, leading to a range of negotiated agreements over the past 30 years between different actors including governments, research institutions, companies, and communities (e.g., Berlin and Berlin, 2004; Greene, 2004; Gamez, 2007; Laird and Wynberg, 2008; Robinson, 2010; UNDP, 2018; Chinsebu and Chinsebu, 2020). While the intention is to use these mechanisms to leverage greater social and economic justice, to induce conservation and sustainable use, and to strengthen the rights of Indigenous and local communities, emerging evidence suggests otherwise. Critics note that ABS agreements reached are typically conflict-ridden, hollow, or obsolete (Berlin and Berlin, 2004; Morris, 2016; Dutfield and Suthersanen, 2019).

Through review of four benefit-sharing cases from South Africa - *Hoodia gordonii*, *Aspalathus linearis* (rooibos), *Sceletium tortuosum* (kougoed) and *Pelargonium sidoides* - each with histories of biopiracy charges, this paper aims to explain this apparent contradiction and thus to draw wider lessons for global responses to biopiracy. Four questions frame the analysis:

- First, have historical injustices of biopiracy been addressed through the benefit-sharing agreements and, if so, to what extent has restorative justice been achieved?
- Second, has the process to develop benefit-sharing agreements been procedurally fair and inclusive?
- Third, have the agreements led to an equitable outcome, that adequately reflects traditional knowledge contributions and different ways of knowing and innovating?
- And lastly, what positive impacts, if any, have materialized for the conservation and sustainable use of biodiversity?

The paper begins by introducing the methodological approach adopted and is followed by a description of the political and legal contexts of bioprospecting and the biodiversity-based economy in South Africa. A critical analysis is then provided of how ABS has unfolded in practice across the four case studies, revealing how questions of restorative justice, procedural fairness, equitable benefit sharing, and conservation have been addressed. Table 1 accompanies this analysis, synthesizing the details of each case in terms of biopiracy charges, commercial use, intellectual property approaches, benefit sharing agreements and their governance, representation, and conservation. A final section integrates the analysis and draws lessons for ABS implementation elsewhere in the world.

2. Methodology

The research draws from in-depth ethnographic material based on more than two decades of work on these case studies in the region, bringing together a body of published and unpublished research, with

¹ As of 21/11/22, cbd.int.

Table 1

Overview of key features characterizing the biopiracy charges, commercial use, intellectual property approaches, benefit sharing arrangements and their governance, representation of Indigenous peoples and local communities and conservation of *Hoodia gordonii*, *Aspalathus linearis* (rooibos), *Sceletium tortuosum* (kougoed) and *Pelargonium sidoides*. Sources: Wynberg and Chennells, 2009; Chennells, 2013; Morris, 2016; van Niekerk and Wynberg, 2012, 2019; Wynberg, 2017; Modise, 2018; National Khoisan Council et al., 2019. Abbreviations: TK – traditional knowledge, SASC – South African San Council, BSA – benefit-sharing agreement, NKC – National Khoisan Council.

Plant species	Biopiracy charge	Origin	Commercial use	Traditional use & knowledge	Benefit-sharing agreements (BSA) & governance	Governance
<i>Hoodia gordonii</i> [now discontinued]	TK of Indigenous San used in CSIR patent application without consent. NGO Biowatch alerted SASC who brought challenge.	Southern Africa	Food Supplement to suppress appetite	Used traditionally by Indigenous San to quench thirst (and hunger).	BSA between state-based CSIR and the SASC.	Trust set up to distribute benefits. Now discontinued.
<i>Aspalathus linearis</i> (rooibos)	100-year old rooibos tea Industry based on TK of San and Khoi without sharing benefits. Challenge brought by SASC and NKC. Nestlé accused of biopiracy due to unauthorized use of rooibos in R&D program and the lodging of 5 associated patents. Challenge brought by NGOs Natural Justice and the Berne Declaration	Western Cape, South Africa	Food and Beverage, Supplements, wide application for anti-oxidant and other properties	Used traditionally for various purposes. Many harvesting practices are traditionally based.	BSA between the Rooibos Council, SASC and NKC. BSA between Nestlé South Africa, SASC and NKC.	The Andries Steenkamp Trust administers benefits on behalf of the SASC. A “Khoikhoi Peoples Rooibos ABS Trust” administers benefits on behalf of the NKC.
<i>Sceletium tortuosum</i> (kougoed, kanna)	Researchers obtained knowledge from traditional healers and lodged patent with no consent. Media attention led to challenge by SASC.	Western and Northern Cape, South Africa	Medicinal product for depression and anxiety (Zembrin®)	Long used among Indigenous San and Khoi as a mild narcotic or intoxicant and to treat pain and other ailments	BSA between HGH Pharmaceuticals and the SASC. SASC receives 5 % of net proceeds and a 1 % exclusivity payment. 50 % of SASC revenues are directed towards the Nama-speaking communities where knowledge was first obtained by the researcher.	SASC receives benefits via the State Bioprospecting Fund. A Trust is set up to distribute benefits to Nama communities.
<i>Pelargonium sidoides</i>	Biopiracy charge against Schwabe led by African Centre for Biosafety, Berne Declaration and traditional healers.	South Africa and Lesotho	Medicinal remedy to treat bronchitis	Widely used as a traditional medicine	BSA exists between German pharmaceutical company Schwabe, South African company Parceval Pharmaceuticals and two traditional councils. Funds are transferred to the chiefs and traditional leadership through the King Sandile Development Trust and Imingcangathelo Community Development Trust.	Unclear how funds are distributed to community.

Plant species	Representation and support	Benefits	Patents	Other forms of intellectual property	Certifications	Custodianship & use	Conservation
<i>Hoodia gordonii</i> [now discontinued]	SASC on behalf of the regional Working Group on Indigenous Minorities. Legal representative supporting the SASC.	SASC to receive 6 % of royalties from products; 8 % of income based on product development targets.	Multiple patents relating to the use of <i>Hoodia</i> to control appetite, as well as for related products and processes, including its propagation.	The BSA requires all forms of intellectual property developed and/or created by the CSIR and based on TK to be vested exclusively with the CSIR. The SASC has no right to claim any co-ownership.	Organic certifications exist for many <i>Hoodia</i> products. There are no ethical trade certifications.	Almost all cultivated on private lands.	Over-harvesting in early years led to CITES Appendix II listing but no wider conservation measures exist.
<i>Aspalathus linearis</i> (rooibos)	SASC and NKC. At a late stage, representatives of “Cederberg Belt Indigenous Rooibos Farming Communities” were brought into negotiations but questions remain about representation and inclusion. Legal representative supporting the SASC. NGO Natural Justice supporting the NKC.	SASC and NKC receive 1.5 % of farm gate price of unprocessed rooibos, divided equally between the two councils.	Over 150 patents relating to a range of applications for food supplements, medicinal and cosmetic applications.	An economic partnership agreement between the European Union and South Africa, has led to the granting of geographic indication status for rooibos. In 1994, a trademark application for the name ‘rooibos’ was filed in the United States, but was contested by the rooibos industry and eventually cancelled.	A range of organic and ethical trade certification standards, including the US National Organic Program (NOP), the Japanese Organic Standard (JAS), CERES and Ecocert. Multiple alternative trade organizations buy and sell Fairtrade rooibos from small-scale rooibos producers and rooibos-producing estates. Ethical trade	Mostly cultivated on private farms with a limited amount of wild harvesting in communal or church-owned areas.	Significant biodiversity impacts from the rooibos industry. BSA does not mention conservation.

(continued on next page)

Table 1 (continued)

Plant species	Representation and support	Benefits	Patents	Other forms of intellectual property	Certifications	Custodianship & use	Conservation
<i>Sceletium tortuosum</i> (kougoed, kanna)	SASC Legal representative supporting the SASC. Nama communities not involved in negotiation process.	SASC benefits include 5 % of net proceeds received by HG&H and an annual exclusivity payment of 1 % on sales. R10 million received since 2010.	Multiple patents linked to treatments for depression and anxiety.	A logo appears on certain products linked to the BSA, indicating endorsement by the SASC. An “exclusivity” payment is made in respect of product endorsement, marketing and branding assistance and the use of the San logo.	certifications include the Union for Ethical Biotrade/ Rainforest Alliance Herbs and Spices Programme. Some farms are organically certified. There are no ethical trade certifications.	All cultivated on private farms.	No mention in BSA.
<i>Pelargonium sidoides</i>	(Incorrectly) assumes all harvesters are subjects of the chieftaincy. Harvesters not affiliated to a chieftaincy or organization are excluded. Lesotho harvesters are excluded. Recasting of harvesters as tribal subjects. Different forms of legal support.	Undisclosed monetary benefits to the chiefs and traditional leadership based on an agreed additional percentage of the price per kg paid to the harvesters. Industry-sponsored private Trust supports range of social and educational projects.	Five patents were revoked by Schwabe due to biopiracy claims and lack of novelty but over 100 patents still exist held by Schwabe and other companies for the processing and preparation of products containing Pelargonium.	The name <i>Umckaloabo</i> is trademarked by Dr Willmar Schwabe GmbH & Co.	No ethical trade certification. Some farms are organically certified.	Cultivated on private lands in and out of the region. Wild harvesting also occurs on communal lands in the Eastern Cape in the Rharhabe Kingdom, organized under Queen Sandile and 42 individual chiefs. Wild harvesting also occurs in Lesotho.	Biodiversity management plan centers on sustainable use of the plant but not wider conservation measures. Industry projects linked largely to social benefits.

the aim of synthesizing existing and new evidence to advance novel understandings, framings and analyses to the above questions. Collectively, research methods have involved semi-structured interviews with producers, harvesters, biodiversity custodians, regulators, industry, non-governmental organizations (NGOs), traditional knowledge holders and other key informants; focus groups and workshops with different actors involved in the use, regulation and conservation of different species; participant observation; value chain analyses; e-mail correspondence; review of the published and unpublished literature; and patent analyses. The analysis also draws on the author's long-standing involvement in policy research in South Africa and elsewhere that explores implementation of the CBD and Nagoya Protocol (e.g. Taylor and Wynberg, 2008; Wynberg et al., 2015; Wynberg, 2018). The conservation component of the paper is based on research conducted for a recent report (Laird and Wynberg, 2021), which included 12 interviews related to the analysis presented in this paper.

For *Hoodia gordonii*, a case which effectively concluded in 2011 following negative clinical trial results, the material is drawn from the author's PhD study (Wynberg, 2006a), a three-year research project funded by the Wellcome Trust (2006–2008), culminating in a book (Wynberg et al., 2009a), and a study to analyze the impact of patents (Wynberg et al., 2009b). Collectively, this involved over 50 interviews with companies, government officials, NGOs, researchers, and Indigenous San representatives, many repeated over the years, as well as archival research. The research on *Aspalathus linearis* (rooibos) is based on longitudinal work that has taken place in the Cederberg region of the Western Cape since 1994. This includes archival research; semi-structured interviews with industry, government, NGOs, small-scale and commercial farmers, and Indigenous groupings; focus groups with small-scale farmers; and a series of workshops to explore intersections of ABS and rooibos (see Wynberg et al., 1994; Downes and Laird, 1998; Wynberg, 2002, 2006a, 2006b; Wynberg and Custers, 2005; Wynberg et al., 2009b). More recently, research has stemmed from a Darwin Initiative project (www.voices4biojustice.org) aimed at developing innovative approaches to build capacity and facilitate the direct, substantive, and authentic contributions of local groups to policy design and implementation. Rooibos has comprised one of several case studies in this project (Wynberg, 2020), and the work continues to evolve.

The third case study, that of *Sceletium tortuosum* (kougoed), has received less research attention than the others. However, the case has been followed since 2000 and involves many of the same actors as for *Hoodia* and rooibos, and thus the empirical base is similar, drawing largely from interviews with industry, government and community actors, patent reviews, and document analysis.

Finally, the *Pelargonium sidoides* case study draws on published (van Niekerk and Wynberg, 2012, 2019) and more recent unpublished research involving semi-structured interviews with government, industry, and NGOs informants; focus groups with harvesters in Lesotho and the eastern Cape; stakeholder workshops to develop a Biodiversity Management Plan; archival records; and secondary literature such as the insightful analysis published by Morris (2016).

Numbered codes used for interviews are as follows, with “SA” referring to South Africa: SAG is government officials; SAI is industry respondents; SAC is Indigenous and local community representatives; SAN is non-government organizations.

3. Political and legal contexts

Bioprospecting and the biodiversity-based economy² have become firmly embedded in economic strategies across southern Africa. South Africa's President Cyril Ramaphosa, launching ‘Operation Phakisa’³ to promote the Biodiversity Economy in 2018, projected the creation of 162,000 jobs and the generation of R47 billion⁴ by 2030, based on a public investment of around R1,18 billion⁵ (Government of South Africa, 2018). Namibian President Hifikepunye Pohamba has likewise placed biodiversity “at the center of our development efforts to achieve sustainable economic growth and poverty alleviation in our country, especially in rural areas” (Government of Namibia, 2014), while other countries across the region have made similar pronouncements.

These strategies are not new, based to a large extent on southern Africa's long-standing promotion of wildlife-based tourism and hunting as an approach to attract foreign revenue and enable community benefits. At the same time, many of the region's plant species have an extensive history of commercialization, often riding on the back of traditional knowledge. For example, the lucrative devil's claw (*Harpagophytum procumbens*) industry has its roots in knowledge of “otji-hangatene” (*Harpagophytum*) passed on in the early 1900s by the Herero Samuel Kariko, to the medical officer Hellwig, who was part of the Imperial Schutztruppe, the German military group that controlled the colony of German South-West Africa (Brendler, 2021). Combined with knowledge published by the botanist Lübbert in 1901, this was later used by German scientists to initiate chemical investigations into the medicinal properties of the plant (Volk, 1964), with trade commencing to Germany in the early 1950s (Brendler, 2021).

Rooibos, the popular herbal tea indigenous to mountainous regions of the South African Cape and long used by local people in these areas, was introduced to European markets at the turn of the 20th century and swiftly established itself as the health tea of choice in South Africa and abroad (Wynberg, 2017). Leaves of *Cyclopia* species (honeybush), similarly have a rich history of use as a herbal tea by local people in the southern Cape, and today form part of a growing industry (Joubert et al., 2011). The fragrant leaves of the buchu shrub (*Agathosma betulina* and *A. crenulata*), were first used medicinally by Indigenous peoples of southern Africa and have been traded commercially on global markets for more than 200 years (Low, 2007); today, a thriving industry exists based on use of the plant as a flavoring and medicine. The commercial use of *Aloe ferox* similarly spans centuries and is grounded on traditional knowledge – of the plant's medicinal uses and the ways in which it is harvested (Chen et al., 2012).

Many ornamental species, such as the geraniums that adorn the streets of cities across the world (mostly cultivars of *Pelargonium zonale* and *P. peltatum*) had their origins in colonial – and, particularly, Dutch explorations of the botanical treasures of southern Africa for economic gain, and today represent an industry valued at millions of Euros per annum (Reinten et al., 2011). These, among many other examples, bear testimony to the long-established trade and exploitation of southern African species for commercial gain in pharmaceutical, agricultural, botanical, cosmetic and food and beverage industries, and to the way in

² The biodiversity-based economy forms part of wider conceptualizations of the bio-economy and is typically centered on the commercial use of biodiversity for economic development and social upliftment (DEA, 2016). Definitions are commonly associated with modern biotechnology, but also include bio-resources, based on the “processing and upgrading of biological raw materials and the establishment of new value chains centered on producing biofuels and managing waste” (Birner, 2018).

³ Operation Phakisa, meaning “hurry up” in Sesotho, is an initiative of the South African government designed to accelerate the delivery of development priorities.

⁴ This approximates to about USD2,6 billion.

⁵ This is about USD64,2 million.

which almost all these industries drew directly from traditional knowledge.

In recent years, however, commercialization has taken a turn, with renewed vigor given both to the potential economic value of indigenous southern African resources – and plants, in particular, and to the benefits these can potentially create for the national coffers of increasingly cash-strapped governments, as well as for local livelihoods and conservation. Spurred by new technologies and growing markets for natural products, and an increased interest in ethical trade and the marketing opportunities associated with the stories of plants and people among socially conscious consumers, a new currency has materialized for biodiversity. The sector has simultaneously become progressively formalized, largely due to over-harvesting and sustainability concerns, and a desire to address injustices and exploitation (Wynberg et al., 2015). Biopiracy fears, and the concentration of intellectual property and capital in the hands of large biotechnology and pharmaceutical corporations in the global North (Carney and Rosomoff, 2010; Robinson, 2010) have provided the backdrop for responses from southern Africa. As Robinson (2010) observes, biopiracy has moved beyond “activist” agendas to become a firm part of shaping government and corporate policies, including the National Anti-Biopiracy Commission in Peru and Sanofi respectively (Bagley, 2018). “We must rid the country of the scourge of biopiracy” remarked one high-level government official in the South Africa Ministry of Science and Innovation (SAG1, interview, 2020), while another senior official from the Department of Environmental Affairs emphasized the need to curb the “rampant biopiracy” in the country when introducing South Africa's National Biodiversity Economy Strategy at a national workshop (SAG2, Limpopo workshop, 2016).

International and national laws have supported trends towards formalization, together with social and ecological labelling and certification systems, often driven by consumer concerns (Sanderson et al., 2018). The increased adoption of intellectual property as an exclusionary strategy has bolstered these efforts. Patent activities reflect how the species diversity of biodiversity-rich countries of the global South is of increasing interest to natural product industries (Oldham et al., 2013), who are also adopting intellectual property tools, such as trademarks and geographical indications, to claim legal ownership of different resources (Coombe et al., 2014). Such trends have implications for the global South, given that most intellectual property ownership related to biodiversity-based innovations resides with companies and institutions in the global North (Oldham et al., 2013; Blasiak et al., 2018). For example, as Wynberg et al. (2009b) reveal in an analysis of value adding in the southern African natural products sector, patents may hamper the degree to which local industries in the global South can add value to their products or may provide an intimidating environment that is perceived as a business risk. For Indigenous peoples and local communities, patents and other forms of intellectual property are unlikely to impede their use of a resource yet may contradict their worldviews (Greene, 2004). As Robinson (2010) illustrates through several examples, the instrumentalist and utilitarian framework that characterizes many forms of intellectual property rights, and which considers natural and intellectual resources to be commodities, is not easily harmonized with traditional laws, customary practices, and social norms.

Two main approaches have evolved in the embracement of commercialization as a development strategy. The first is biotrade, meaning the collection, transformation and commercialization of products derived from biodiversity, usually for the personal care and cosmetic, food and beverage, botanical medicine and other sectors relying on the sourcing of raw materials. These non-timber forest products are the backbone of many rural economies throughout the region (Shackleton and Shackleton, 2004; Shackleton et al., 2011) and their commercialization has long been seen as a means to alleviate poverty among Indigenous and local communities while enabling biodiversity conservation (e.g. Neumann and Hirsch, 2000; Arnold and Ruiz-Pérez, 2001; Belcher and Schreckenberg, 2007; Shackleton and

Pullanikkatil, 2019).

Over the past three decades a second strategy has emerged, centered on biodiscovery (also known as bioprospecting), which is “the collection of and research on samples of biological resources to discover genetic information or biochemicals of value” (Reid et al., 1993). Biodiscovery usually takes place in high technology and research-intensive sectors, such as pharmaceutical and biotechnology industries, but is also a strategy for crop protection, food and beverage, cosmetics, and other industries. Biodiscovery researchers typically seek physical access to genetic resources, but as genetic technologies have advanced, they increasingly use genetic sequence data obtained through publicly accessible databases such as those which form part of the International Nucleotide Sequence Database Collaboration (INSDC). The CBD and accompanying ABS agreements were originally linked to biodiscovery, but implementation of the Nagoya Protocol has led to increasing use of ABS agreements in biotrade as a tool to strengthen equity and fairness in trade relations.

Southern African countries have increasingly adopted ABS in national laws and regulations, led largely by South Africa which initiated an ABS policy process as early as 1996 following the country's 1995 CBD ratification (Crouch et al., 2008; Wynberg, 2018). South Africa promulgated its National Environmental Management Biodiversity Act (10) in 2004, followed in 2008 by Bioprospecting, Access and Benefit Sharing Regulations (Wynberg, 2018). In contrast to many other countries, South Africa thus promulgated ABS legislation *prior* to the adoption of the 2010 Nagoya Protocol, although parts of its legal framework have since been adjusted to align it with the Protocol which it ratified in 2014. In Namibia, the Access to Biological and Genetic Resources and Associated Traditional Knowledge Act (2) was promulgated in 2017 (Chinsebu and Chinsebu, 2020), with regulations effective from November 2021. Zimbabwe and Botswana similarly have legal instruments in place relating to ABS but none have been fully adopted in practice (Nott, 2019).

South Africa by far has the most developed, complex, and wide-ranging ABS regulatory architecture and, with dozens of benefit-sharing agreements brokered and over 130 permits issued to date by the national government, the most experience in ABS implementation. A notable distinction of the South African law is its inclusion of *both* biotrade and biodiscovery, essentially setting up a permit system for all activities associated with the use and development of indigenous biodiversity – from the harvesting of resources through to research, trade and processing, requiring benefit-sharing agreements to be negotiated as a condition of permit approval. This wide scope diverges from the more limited definition set out in the CBD and Nagoya Protocol, which excludes biotrade.

While the legal and political intent of these requirements is clear, surprisingly little analysis has transpired of how biopiracy histories have affected these outcomes. Similarly, few studies have situated ABS within the broader framing of commodification, or engaged with how ABS has surreptitiously emerged as the dominant discourse for addressing inequalities and injustices in the natural product sector in South Africa.

4. ABS in practice

4.1. Addressing biopiracy and achieving restorative justice

One of the most iconic biopiracy cases of all – in southern Africa and globally – is that of *Hoodia gordonii*, a succulent plant first researched in

the early 1960s by the South African State-funded Council for Scientific and Industrial Research (CSIR) for its appetite and thirst-quenching properties (Wynberg and Chennells, 2009). The CSIR was granted a patent for these properties,⁶ and commercial agreements commenced with the UK-based company Phytopharm and pharmaceutical giant Pfizer to develop an anti-obesity drug. However, the agreements occurred without the consent, knowledge or involvement of Indigenous San, notwithstanding their knowledge being the basis for the research (Wynberg, 2004; Wynberg and Chennells, 2009). Astoundingly, the CSIR had told Phytopharm that the hundred-thousand-strong San “no longer existed” (Barnett, 2001). In response to an intervention by the NGO Biowatch South Africa, and a public outcry, the first-ever benefit-sharing agreement in South Africa was finalized in 2003 – between the CSIR and the South African San Council – representing the three Indigenous San communities of South Africa—!Khomani, !Xun and Khwe (CSIR and South African San Council Benefit-sharing Agreement, 2004).

Safety and efficacy concerns led to the closure of the *Hoodia* project (Blom et al., 2011), but it set a significant precedent. Although the South African San Council received relatively insignificant monetary benefits (about USD50,000), the case showed that benefit sharing with Indigenous peoples was possible. Importantly, the process to develop the agreement fostered capacity within the South African San Council to negotiate with industry and enable benefits. Representatives of Indigenous San and lately Khoi, organizations are today at the forefront of multiple commercial deals involving South African biodiversity, accompanied by claims of traditional knowledge. For example, *Sceletium tortuosum*, known commonly as kougoed or kanna, is a succulent plant recognized for its mood-enhancing and calming properties. It has been long used among Indigenous San and Khoi as a mild narcotic or intoxicant and to treat pain and other ailments (Gericke and Viljoen, 2008). Knowledge from Nama-speaking traditional healers from two villages in the Northern Cape province of South Africa, Nourivier and Paulshoek, guided researchers towards its use, and the patented extract⁷ is now incorporated into medications to improve cognitive function and treat anxiety and depression (Chennells, 2013; Modise, 2018; Brendler et al., 2021). Early research did not obtain the prior informed consent of knowledge holders, but media attention and regulatory requirements led to a later benefit-sharing agreement between HG&H Pharmaceuticals and the South African San Council which recognizes both the original contribution of an organized group of Nama stakeholders and those of Indigenous San (HG&H and the South African San Council, 2011).

The most recent case is that of rooibos tea, *Aspalathus linearis*, South Africa's most successful and oldest indigenous natural product industry, and the range of novel products that incorporate the plant. These include novel foods, slimming preparations, cosmetics, extracts and flavorings. Rooibos is today a USD20–25 million local industry, employing up to 8000 people and with some 20,000 tons traded each year (DAFF, 2016; Rooibos Council, 2020). However, in common with many other industries in South Africa, this economic prosperity has been accompanied by dispossession and denigration (Coombe et al., 2014; Ives, 2017). Beginning with massacres of San and Khoi in rooibos-growing landscapes centuries ago (Penn, 2006), dispossession of Colored and Black people in the area was completed and codified through the 1913 Natives Land Act. Today, marginalization persists through the legacy of

Apartheid policies, most notably through the creation of a Rooibos Tea Control Scheme that disqualified Colored rooibos farmers from receiving government support and subsidies (Wynberg, 2017). About 240 descendants of these farmers now grow rooibos in the mountainous regions surrounding the Cederberg village of Wupperthal and in the arid Suid Bokkeveld, mainly for Fairtrade markets.

In 2010, the seemingly illegal use of rooibos in research and development became a central focus of biopiracy accusations, initiated through a media campaign led by two NGOs, Natural Justice, and the Berne Declaration. This campaign reacted to five patent applications lodged by Nestec S.A., the technical, scientific, commercial, and subsidiary of consumer giant Nestlé for the use of rooibos and honeybush to treat inflammation as well as skin and hair conditions.⁸ Nestlé had conducted research without the necessary permits to use South African genetic resources under the Biodiversity Act (Berne Declaration and Natural Justice, 2010). In parallel to these developments, the South African San Council claimed to be “primary knowledge holders of rooibos” and demanded the right to benefit. A benefit-sharing agreement was subsequently finalized in 2014 between Nestlé South Africa, the South African San Council, and the National Khoisan Council.⁹ The two councils receive 3 % of net sales of an innovative tea-vending machine product, shared equally between them (Wynberg, 2017). More ambitious negotiations were launched in 2010 following an appeal by the South African San Council to the Director-General of Environmental Affairs to recognize San (and in later years Khoi) traditional knowledge and associated intellectual property rights for rooibos and honeybush (Chennells Albertyn, 2010). Nine years of government-facilitated negotiations between two Indigenous Councils and the industry-led Rooibos Council, led to the eventual signing of a benefit-sharing agreement in 2019 (Wynberg, 2019; Schroeder et al., 2020).

Between 2007 and 2010, biopiracy accusations also underpinned a formal patent challenge by two NGOs, the African Centre for Biosafety, and the Berne Declaration, and traditional healers from the Masakhane community in the Eastern Cape province of South Africa. The case hinged on patents linked to *Pelargonium sidoides*, a plant occurring in South Africa as well as much of Lesotho that is locally used as a traditional medicine (ACB, 2008). The red tubers of this plant form the basis of *Umckaloabo*, a popular treatment for bronchitis made by the German pharmaceutical company Schwabe and its South African counterpart Parceval Pharmaceuticals (van Niekerk and Wynberg, 2012, 2019).

Largely because of negative publicity, and a fear of being labelled “bio-buccaneers”, Schwabe renounced four of its patents in 2010, with a

⁸ Multiple patents exist for compositions based on the properties of rooibos and its extracts, as well as associated processes. The five patents referred to here were filed as WO patents in 2009 and include (1) WO2010000564, “Rooibos and inflammation”; (2) WO 201000058, “Use of rooibos or rooibos extracts with prebiotics for skin and hair”; (3) WO2010000578, “Use of honeybush or honeybush extracts with prebiotics for skin and hair”; (4) WO 2010000579, “Use of rooibos or rooibos extracts for skin and hair”; (5) WO2010000577, “Use of honeybush or honeybush extracts for skin and hair” (Berne Declaration and Natural Justice, 2010).

⁹ Although absent from *Hoodia* negotiations, the National Khoisan Council, established by former President Nelson Mandela in 1999 to accommodate Khoisan historical leadership within South Africa's constitutional framework, has increasingly become a partner to various benefit-sharing agreements, in collaboration with the South African San Council. Within the Khoi-San movement this privilege is ascribed to its political alliance, and hence favored position, with the ruling African National Congress (ANC). Many other organizations represent the Khoi-San in addition to the NKC.

⁶ The case is atypical in that almost all commercial activity results from a single patent application W09846243 “Pharmaceutical compositions having an appetite-suppressant activity”. The initial CSIR South African application was followed by an international application that was pursued in 81 countries including the US, Europe, South Africa and other African countries (Wynberg et al., 2009b).

⁷ US6288104B1, filed in September 2021 by Pharma Natura (Pty Ltd) ZA for a “Pharmaceutical compositions containing mesembrine and related compounds”.

fifth revoked for lack of an inventive step.¹⁰ Shortly thereafter, a benefit-sharing agreement was developed between Parceval and the King Sandile Development Trust, the Imingcangathelo Community Development Trust and other traditional councils, partnerships which Morris (2016, 526) describes as “entrenching and in some instances expanding, apartheid-associated boundaries and configurations of power”.

Despite both apparent and real victories, all these cases are indisputably rooted in histories of exploitation, oppression, and marginalization, with cries of biopiracy often echoing the wider injustices that have occurred, especially for Indigenous San and Khoi. Here, ABS is offered as a remedy, a chance to make good and to bring about redress through financial redistribution despite acknowledged flaws of representation and conflicting paradigms. Patenting, for example, and the idea of “owning” life is abhorrent to many Indigenous worldviews, yet according to the lawyer representing San in *Hoodia* negotiations, the principle of “no patents on life” was considered “too expensive” (Wynberg, 2004). As the next sections reveal, ABS and the resources and promises it offers have also led to a clamor for representation, within a political climate where identity is continuously shape-shifting (Mellet, 2020). The remedies for biopiracy emerge as modes of accumulation in an extractive economy, arguably entrenching inequalities and a form of “biodiversity apartheid”, rather than achieving restorative justice.

4.2. Procedural fairness and representation

Equity is concerned as much with the outcome of negotiations as it is with the process developed to get there. Wynberg and Hauck (2014) emphasize how the engagement of different actors in benefit sharing is enabled (or disabled) by negotiating processes and describe how procedural fairness is an integral part of benefit sharing. McDermott et al. (2013) articulate the concept of *procedural* equity, referring to decision-making and the inter-linking dimension of *contextual* equity, meaning pre-existing conditions that restrict or enable people's access to decision-making processes, resources and, therefore, benefits. As the examples illustrate, procedural fairness is very much the beleaguered stepchild in the ABS process.

ABS as currently conceptualized obliges governments – in this case South Africa (but the argument could be made more widely) – to adopt an approach whereby those seeking permits must negotiate with an organized legal entity (and, in terms of the South African law, those with a “leadership structure”), and agree on a benefit-sharing outcome that is “mutually acceptable”. In doing so, the assumption is made that communities are sufficiently organized and capacitated to develop a legal standing and that those represented are the legitimate claimants.

Unfolding experiences from South Africa cast doubts on these assumptions and suggest that the ABS legal architecture is pre-destined to prefer groupings that are already organized as legal entities, to favor certain groups over others, and to entrench existing marginalities. Moreover, regulatory requirements have sometimes pushed industry to self-identify traditional knowledge holders and to locate representative and legally constituted communities with whom to negotiate benefit-sharing agreements, often leading to spurious arrangements. For example, negotiations have concluded with traditional authorities, who may not be the knowledge holders, or with organizations who do not represent all knowledge holders. The concern, as reported by van Niekerk and Wynberg (2012, 2019), Morris (2016), Duffield et al. (2020)

and others, is that this can give rise to elite capture, by those who are more organized than others, or by traditional authorities who may not be democratically elected or widely accepted as the recognized representatives of traditional knowledge holders. Commented a company representative: “The system of giving money to chiefs is a disaster waiting to happen; now that the Department of Environmental Affairs has begun to roll out this approach it will be impossible to go back” (SAI1, interview, 2016).

In the case of *Pelargonium sidoides*, Morris (2016, p. 536) similarly describes how ABS has “fostered business partnerships between South African traditional leaders and multinational pharmaceutical companies” and has led to a situation where “ABS rights are currently instruments of tribal subjectification and thus an important mode of accumulation for traditional leaders”. Industry representatives have remarked how the assignment of traditional knowledge holders by authorities may “provide clarity on the one hand” but “creates the potential for a monopoly and therefore bears the danger of holding the user to ransom during negotiations” (Michiels et al., 2021, p. 6). The state has tended towards “pragmatic” but simplistic solutions, accepting the legitimacy of traditional authorities and other groups but without fully interrogating the social and economic repercussions of these decisions, nor the danger of perpetuating existing power imbalances. This has been bolstered by the recent adoption of the Traditional and Khoi-San Leadership Act (3 of 2019), widely criticized as “giving new oppressive powers to unelected chiefs in the same way the apartheid government did by giving chiefs the power to take decisions on communal land without consent from those whose rights are directly affected” (Pikoli, 2019).

Questions of priority – or “who was first” – have been especially contentious. In the case of rooibos (and honeybush) tea, the South African San Council and the National Khoisan Council initiated demands in 2010 that industry “recognize their role as primary knowledge holders” (Chennells Albertyn, 2010). A government-commissioned report resolved there was “no evidence to dispute this claim” and “urged” those involved in bioprospecting or biotrade using rooibos or honeybush to negotiate benefit sharing with participating San and Khoi communities (DEA, 2014). Fears that they would not receive a permit to trade led the rooibos industry to begin benefit-sharing negotiations with the South African San Council, the National Khoisan Council and their legal representatives (Wynberg, 2017; Schroeder et al., 2020). The government-facilitated negotiations led to the finalization of a benefit-sharing agreement in March 2019, nine years after the process commenced.

The negotiations were fraught, divisive, and due in part to the signing of non-disclosure agreements, but also because of vested interests, untransparent. Reacting to the rooibos benefit-sharing agreement, an Indigenous Khoi-affiliated organization that was not part of the negotiations remarked “We never heard anything until we saw the signed agreement on national television” (SAC1, interview, Cape Town, 2020). Other Khoi-San community leaders resorted to legal campaigns against the National Khoisan Council because of a lack of financial transparency.

There was significant discord about the lack of recognition of small-scale rooibos farmers and contemporary custodians of the plant. Many Indigenous San and Khoi were moved to distant places far away from rooibos-growing areas because of colonial persecution and apartheid policies. Today, those who identify as Khoi-San are thus mostly physically disconnected from the plant, many living in urban centers far removed from the mountainous areas where rooibos grows. Notwithstanding their displacement and dislocation, these descendants still carry memories of “making veld tea” and remain connected to family and the mission stations in the area. Different knowledges, identities and connections to the land and plant exist among the small-scale rooibos farmers and farmworkers who remained in the rooibos-growing areas, but these mixed-race descendants of European settlers, former slaves, and Khoi and San do not all identify as “Indigenous”. Despite the request to be “full and equal” partners, government saw the rooibos farming

¹⁰ These included (1) EP1429795A, a method for producing extracts of *Pelargonium sidoides* and/or *Pelargonium reniforme*, (2) US2006263448a1, the use of extracts from roots of *Pelargonium sidoides* and/or *Pelargonium reniforme* for treating AIDS and AIDS-associated infections; (3) EP1651244, the use of extracts from roots of *Pelargonium sidoides* and/or *Pelargonium reniforme* for medicines to treat disease-related behavioural changes; and (4) EP1763520, the use of trisubstituted benzopyranones that are extracted from *Pelargonium* species.

communities as “social responsibility projects” who should not form part of the negotiations (SAG3, interview, 2018) while members of the South African San Council believed small-scale Colored rooibos farmers “already had benefits” due to their sale of Fairtrade rooibos tea in global markets (SAC2, interview, 2018). The benefit-sharing negotiations therefore largely excluded small-scale Colored farmers and farmworkers, with their inclusion only under the umbrella of the National Khoisan Council (Wynberg, 2019; Ives et al., 2020). In a similar way, the custodians of *Sceletium* in the Northern Cape had no say in the lodging of a patent based on their knowledge, nor did they participate in negotiating an agreement on the back of this knowledge (SAN1, e-mail correspondence, 2012). Equally, non-San groups with traditional knowledge of *Hoodia* species, such as Nama, Damara and Topnaar, were excluded from benefit-sharing negotiations, likely due to the sheer impossibility of including representation for multiple groups, located in remote areas across three countries (Wynberg and Chennells, 2009).

The requirement for legally constituted entities with whom to negotiate further entrenched these marginalities. A commonality across all cases points to the lack of legal organization among local resource custodians and knowledge holders – whether they be healers in Paulshoek harvesting *Sceletium*, farmers or farmworkers in the Cederberg tending rooibos fields, or Nama and Damara using *Hoodia* in Namibia. Benefits can only be leveraged if these knowledge holders and custodians are constituted as an organized legal entity. The advantages of doing so are palpable. For example, both the South African San Council and the National Khoisan Council were legally constituted prior to the 2004 Biodiversity Act and its 2008 regulations and built-up capacity to negotiate with industry and leverage benefits. They also both had significant support from external organizations, with the San Council represented by legal firm Chennells Albertyn which supported all preceding benefit-sharing agreements, and the National Khoisan Council represented by the legal NGO Natural Justice. Important lessons emerge from these cases, affirming the significance of history, experience, and legal support, but also suggesting this could lead to new forms of exclusion.

While recognizing and rewarding traditional knowledge is clearly critical and necessary, these experiences suggest that “proving origin” may favor holders of traditional knowledge or genetic resources who are politically connected, well organized and resourced and more “visible”. In the process, others who are less capacitated or connected may be excluded, despite having equally valid claims (Dutfield et al., 2020). The marginalization of certain communities and groups may be entrenched in the process.

4.3. Equitable benefit sharing?

Those involved in supporting and negotiating the agreements described have largely acknowledged that pragmatism guided their decisions and deliberations, with the justification that a more inclusive process would stall business opportunities and limit benefits for communities (Wynberg and Chennells, 2009; Chennells, 2013). Once benefits are channeled to representative groups, proponents argue, their distribution can be routed via appropriate governance structures and with suitable oversight (Chennells, 2013; Schroeder et al., 2020). Two questions emerge from these assumptions: first, what is the nature of the benefits that are agreed upon (and how are decisions reached about them); and second, what does governance look like on the ground?

Table 1 summarizes the negotiated benefits. Arising from the *Hoodia* agreement (CSIR and South African San Council Benefit-sharing Agreement, 2004; see also Wynberg, 2004; and Wynberg and Chennells, 2009 for comprehensive analyses), the South African San Council was to obtain 6 % of all royalties received by the CSIR from Phytopharm for *Hoodia* products. The South African San Council would also receive 8 % of the milestone income received by the CSIR from Phytopharm when certain targets were met (Clause 1.5). If commercialization succeeded, these levies would be disbursed to a Trust set up by the CSIR and the South

African San Council to “uplift the standard of living and well-being of the San peoples of southern Africa” (Clause 1.5). Clause 4 states that “any intellectual property developed and/or created by the CSIR”, including that resulting from traditional knowledge of *Hoodia*, “remained vested exclusively with the CSIR” and the San Council had “no right to claim any co-ownership of the patents or products” arising from the patents (Clause 4). The San Council was also barred from “assisting or entering into an agreement with any third party for the development, research and exploitation of any competing products or patents” (Clause 6.1.4).

Because *Hoodia* knowledge is held broadly among San across the southern African region, a set of principles for benefit sharing was developed by San groups from South Africa, Namibia and Botswana. These included an agreement for 75 % of all Trust income to be distributed equally to San Councils in these three countries. The remaining 25 % was split between the Trust's administration (10 %); an emergency “reserve fund” for the regional Working Group of Indigenous Minorities in Southern Africa (WIMSA) (10 %); and the administration of San networks (5 %) (Wynberg and Chennells, 2009). Non-binding agreements were also made to focus on land tenure and security, education, and leadership empowerment. Although commercialization was later abandoned due to health concerns arising from clinical trials, a total of R569,000¹¹ was received by the newly established Trust.

In the case of *Sceletium*, the South African San Council receives 5 % of “net proceeds received by HG&H” and an “annual exclusivity payment of 1 percent on sales” (HGH Pharmaceuticals and the South African San Council, 2011). The “exclusivity” payment is made in respect of product endorsement, marketing and branding assistance and the use of the San logo. The South African San Council undertakes to place 50 % of all royalties into a trust account for onward payment to the Paulshoek and Nourivier communities. As of 2018, approximately R10 million¹² had been secured by the South African San Council arising from the agreement (Modise, 2018).

A different model is adopted for the rooibos benefit-sharing agreement, whereby a form of annual “tax” is levied for all processed rooibos, comprising 1.5 % of farm-gate price.

The South African San Council and the National Khoisan Council receive equal proportions of the levy, with the Andries Steenkamp Trust overseeing benefits for the South African San Council while the Khoikhoi Peoples Rooibos ABS Trust does so for the National Khoisan Council. The agreement notes that “Rooibos indigenous farming communities” will receive an undetermined portion from the Trust set up for the Khoi (Clause 5.5), although the “Khoikhoi Peoples' Biocultural Protocol”, developed with support from the NGO Natural Justice, states that of its 50 percent allocation, 20 % is apportioned towards administration, 15 % to the National Khoisan Council, and 65 % is split equally between organizations representing Griqua, Nama, Koranna, Cape Khoi, Cederberg and ‘additional’ groupings (National Khoisan Council, Cederberg Belt Indigenous Farmers Representatives, 2019). In 2022, a payment of ZAR12,2 million¹³ was made to the two Trusts (DFFE, 2022).

Information about the *Pelargonium* benefit-sharing agreement remains confidential but involves undisclosed monetary benefits to two traditional councils calculated as a percentage of the price per kilogram that is paid to harvesters. Outside of the formal agreements, an industry-sponsored private Trust supports a range of social projects (Feiter, 2019).

At face value these combined amounts are significant, undeniably creating economic opportunities and providing important recognition of historical injustices. However, given that the scales are tipped from the outset to favor those with economic power, resources and capacity, the question as to whether they are “fair and equitable” remains equivocal.

¹¹ This equates to about USD31,000.

¹² This equates to about USD540,000.

¹³ This equates to about USD664,400.

Benefits received by San organizations from *Hoodia*, for example, amount to a fraction - between 0,03 % and 1,2 % - of net sales of the product (Wynberg, 2004). The terms of the agreement - although now obsolete - are also questionable. Profits gained by Phytopharm and its partners remain untouched while the San Council is prohibited from using their traditional knowledge of *Hoodia* in any other marketable products (Clause 6.1.4). Such restrictions not only entrench existing inequalities, but also undermine innovations that could stem from Indigenous-derived knowledges that are more appropriately located and tailored to meet local development needs (Jimenez et al., 2022).

In the case of rooibos, the irony is that the 1.5 percent levy must be paid not only by the large white commercial rooibos farmers who own 93 % of the land and dominate the industry, but also by the small-scale Colored rooibos farmers who continue to farm rooibos, but own or manage only 7 % of rooibos tea lands and remain economically marginalized (Ives, 2017). A small-scale farmer producing for Fairtrade markers remarked on the irony and double injustice of the situation: “As soon as it looks like we’re making progress and levelling up, we’re pushed back down because we’re punished for our ancestor’s knowledge” (SAC3, interview, 2020). These small-scale farmers are included in the benefit-sharing agreement only nominally, as part of the National Khoisan Council, and receive less than 5 % of the total value of the levy. As one small-scale farmer stated: “We don’t want to pay for our knowledge!” (SAC4, workshop, Nieuwoudtville, 2020).

Outside of the benefit-sharing agreement, different inequities emerge, seemingly flouting the principles of global justice embraced by the CBD and its Nagoya Protocol. For example, the bulk of rooibos is exported for use in herbal tea blends, largely due to dominance by a handful of key international tea brokers. Moreover, the more than 150 patents associated with rooibos are almost all foreign owned (Wynberg et al., 2009b). Some steps have been taken to address these disparities, including an economic partnership agreement between the European Union and South Africa, which recognizes the origin and provenance of rooibos through use of a geographical indication. This was catalyzed by a decades-long dispute ensuing from a 1994 application to trademark the name “rooibos” in the United States, and its ultimate termination (WIPO, 2022). Tools such as geographical indications may lead to progressive social change, but, as Coombe et al. (2014, p.234) remark, will only do so if framed as a “rights-based” approach that would “squarely address long histories of exploitation, dispossession, and disenfranchisement, including some form of distribution of lands to non-white residents to enable them to maximize the livelihood security that rooibos could provide”.

Similarly, in the *Pelargonium* case, harvesters may benefit from better pricing, a more secure trade relationship through the ABS agreement, and social responsibility programs, but continue to be suppliers of raw material at low prices (van Niekerk and Wynberg, 2019). Although biopiracy campaigns led to the revocation of several *Pelargonium*-related patents, harvesters continue to live on the margins and their livelihoods remain little changed (Morris, 2016).

Combined, these cases suggest that while agreements have led to some financial benefits, a “business as usual” approach prevails that neither transfers power nor enables a community-based or owned approach to commercialization. Control remains vested in two key assets: land, with ownership remaining highly skewed towards industry partners and the monopolization of markets through cultivation; and intellectual property which, as Table 1 illustrates, demonstrates an increase in the number of patents and other forms of intellectual property that remain disassociated from sharing benefits with knowledge holders, biodiversity custodians and resource owners.

4.4. ABS and conservation

The ABS agreements described have largely centered on benefits arising from the use of traditional knowledge, but what of the resource and its conservation? The three CBD objectives of conservation,

sustainable use, and fair and equitable benefit sharing were conceptualized to be mutually supportive. Bioprospecting was intended to create incentives for governments to conserve the “green gold” held in their forests and other ecosystems, while also tackling the colonial appropriation and contemporary injustices of biodiversity use and commercialization. There are multiple ways this could happen. Biodiscovery could, for example, contribute to conservation through support for biodiversity research and through fostering equitable collaborations and technology transfer with high biodiversity but income-poor countries. Through biotrade, sustainable harvesting could be supported, efforts could be made to domesticate threatened and high-value species, and schemes could be developed to restore degraded lands and waters and to reforest logged areas (Laird and Wynberg, 2021).

However, although some exceptions exist, in practice there is little evidence of ABS leading to the leverage of significant conservation benefits, either globally or in its 15 years of implementation in South Africa (Laird and Wynberg, 2020). One reason is because of political pressures to prioritize economic benefits, particularly in developing economies such as South Africa where basic needs are pressing. Remarked one government official (SAG4, interview, 2020), “Benefit-sharing agreements ... provide the mechanism for stakeholders to be custodians and to enhance conservation but this is absent at the moment. This is because the emphasis is on benefit sharing, not on sustainable use. Thus, benefits are conceived ... as a monetary thing without looking at the resource”. In contrast to approaches such as community-based natural resource management, where some land and resource rights may be devolved by the state to conservancies or community forests, who manage resources based on agreed management practices (Sullivan, 2002), ABS agreements are often disconnected from geographical, historical and cultural contexts. This is especially the case in South Africa, where biodiversity conservation is deeply embedded in the country’s traumatic past of colonialism and apartheid. Although the country has made impressive and important scientific achievements in biodiversity conservation, many are tied to racially-based land dispossession to make way for protected areas, including restrictions on the use of biodiversity. Perceptions about conservation are therefore often hostile. This is aggravated by a convoluted and cumbersome ABS legal framework, which separates “resource owners” and “traditional knowledge holders”, establishing different processes, negotiating platforms and benefit-sharing agreements, each devoid of local, geographical, environmental and cultural contexts.

Such decouplings are incongruous given that a strong relationship exists between traditional knowledge and conservation. About 80 % of the world’s biodiversity is under the custodianship of Indigenous peoples and local communities. Their integral knowledge of nature is entwined with their ways of life and cultures, and where social systems remain intact, customary governance and customary practices deeply inform the sustainable use of biodiversity in their territories (IPBES, 2019; Forest Peoples Programme et al., 2020). Yet, as the case studies reveal, the picture is inordinately more complex than it seems. Part of the reason for this disconnect is because traditional knowledge holders claiming benefits through Indigenous organizations are not always the same as resource custodians. In South Africa, colonial and apartheid policies dispossessed Indigenous and local people from their land and resources, leading to a geographical and physical dislocation from resources over which their families held knowledge.

The described cases illustrate the small role that conservation has played in ABS agreements to date. In the case of *Hoodia*, health concerns precluded commercialization, but it is notable that the agreement, despite recognizing San “interrelatedness with nature in all its forms, over the ages”, includes no reference to conservation except for a proviso that legal “best practices” will be applied “with the collection of any plant species for observation, and by ensuring that no negative environmental impacts flow from the proposed bioprospecting collaboration” (Clause 3.6). Likewise, the rooibos benefit-sharing agreement focuses exclusively on reparations for traditional knowledge but pays no

attention to the significant biodiversity concerns that accompany rooibos cultivation and, to a lesser extent, wild harvesting. Similarly, the *Sceletium* agreement, a value chain that is based almost entirely on cultivated material, is centered on traditional knowledge with no attention given to the wild resource or habitat from which it was originally drawn. The reliance of the *Pelargonium* industry on both wild-harvested and cultivated material means that greater emphasis is given to sustainable use, including two large-scale resource assessments, a Biodiversity Management Plan and a post-harvest recovery study. However, these fall outside of the formal benefit-sharing agreement and are exclusively species-focused, rather than considering wider conservation measures linked to the habitat or ecosystems in which *Pelargonium sidoides* occurs. “I have never been asked [by government] to change an agreement to deal with conservation”, remarked one of the permit applicants for *Pelargonium* (SAI2, interview, 2020).

While ABS arrangements are largely silent on conservation, it is striking that for each of the described cases the biodiversity challenges are significant. For example, the explosion of market interest in *Hoodia* and a parallel price surge led to extensive over-harvesting, resulting in its listing as a CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendix II species (Wynberg and Chennells, 2009). Rooibos production grew from 14,000 ha in 1991 to over 60,000 ha in 2016, threatening at least 149 taxa due to large-scale cultivation (Raimondo and Von Staden, 2009). The over-harvesting of *Pelargonium sidoides* is also a long-held cause for concern (van Niekerk and Wynberg, 2019).

The strategy of the South African government has been to pursue cultivation as a strategy to both achieve magnitudes of production and to reduce pressures on wild species (DEA, 2016). However, in the “Operation Phakisa” rush to roll out a plan, this has been done without giving adequate recognition to environmental and social implications. Multiple studies reveal how cultivation induces shifts in benefits away from resource-poor wild harvesters towards those who have capital and land, while intensification may also be associated with land clearing, and the use of external synthetic inputs such as fertilizers and agrochemicals (e.g., Dove, 1995; Sunderland et al., 2004). Cultivation may also lead to a further disjuncture between resource custodians and knowledge holders, reducing incentives for conservation.

The conclusion from this analysis is that policies and strategies currently pursued by the South African government for biodiversity commercialization more generally, and ABS in particular, have not been successful in creating incentives for conservation and sustainable use, despite this being a *raison d'être* for these market-based approaches. The reasons are due to multiple, inter-connecting factors, including the tendency for government to prioritize economic development over biodiversity conservation, laws and policies which do not adequately embed conservation in ABS agreements, and insufficient interest on the part of industry to “go further”. There is also insufficient recognition of local communities as biodiversity custodians, which is exacerbated by laws and ABS agreements that separate traditional knowledge and biological resources. Opportunities exist for ABS agreements and approaches to enable strengthened land tenure and resource rights, and to support customary practices that strengthen conservation and sustainable use, but this has seldom if ever occurred.

5. Conclusion

This paper set out to review the increasing adoption of benefit sharing as a response to biopiracy. Through review of a selection of four cases of biodiversity commercialization in South Africa – *Hoodia gordonii*, *Aspalathus linearis* (rooibos), *Sceletium tortuosum* and *Pelargonium sidoides* – it explored the extent to which historical injustices of biopiracy have been addressed; critiqued the fairness of processes implemented to develop benefit-sharing agreements; analyzed their outcomes and the relationship between benefit sharing, intellectual property and innovation; and unraveled the connection between ABS and the conservation

and sustainable use of biodiversity.

The extent to which benefit-sharing agreements have addressed biopiracy concerns is ambivalent. The cases illustrate that through financial redistribution and other means, ABS approaches have been offered as a chance to bring about redress to those whose knowledge or biodiversity has been used commercially, often without consent, and who typically represent some of the most marginalized communities across southern Africa. Unquestionably, the cases described demonstrate that ABS has succeeded in establishing ground-breaking precedents that give recognition to traditional knowledge holders, while acknowledging the inherent inequities of trade in natural products, and to some extent modifying business practices. They thus represent a small but important step forward towards restorative justice.

However, the cases also suggest that ABS may have created more problems than it seeks to solve. The processes to develop benefit-sharing agreements have tended towards expedience rather than inclusivity, often comprising a hand-wave towards adequate representation. Already, the resources and promises offered are leading to a combined clamor for representation, a rejection of the agreements being negotiated, and a favoring of those more visible, better organized and resourced, or politically well-connected.

The cases also demonstrate that ABS approaches have not challenged the *modus operandi* of current practices. As a result, the extent to which they can achieve equitable outcomes is limited. Like the “anti-politics” machine described by Ferguson (1994), ABS continues to remain disconnected from, and indeed ignorant of, the wider political and economic struggles faced by communities, instead serving as a legal compliance mechanism to justify a “business as usual” approach but without fundamentally shifting power relations or economic disparities. Unlike neighboring Namibia, Botswana and Zimbabwe, community-based or owned approaches to biodiversity commercialization remain surprisingly absent from South Africa landscapes. Instead, control is vested in land, markets and intellectual property. Indeed, as West (2012, p. 22) concludes, “the prominence of ABS structures can be attributed to their ability to incorporate traditional knowledge and genetic resources into dominant structures to protect intellectual property without challenging the inherently unequal legal treatment of industrially and traditionally produced knowledge”. ABS structures can thus be seen as a “natural corollary of IPR” (West, 2012, p. 22), with benefit sharing introducing (previously alien) concepts of “property, exclusivity and exclusion” to local communities (Brush, 2007). Within this context, benefit sharing emerges as a neoliberal concept detached from people and place, and from the collective deliberation that characterizes local innovation (Jimenez et al., 2022). Traditional knowledge is seen to be useful only in its disembodied, objectified form, disassociated from its context and innovators (Orozco and Poonamallee, 2014), to be absorbed and assimilated in market-driven strategies that continue to favor companies and governments of the global North.

Finally, there is little evidence that ABS has led to conservation, despite this “use it or lose it” argument being the cornerstone of the CBD. This has been due in part to inadequate recognition of the critical role played by communities as biodiversity custodians and key decision-makers in conservation planning and management, but also to the blinkered way that governments have pursued ABS as a silver bullet for economic development.

Placed under overwhelming pressure to create jobs, stimulate economic growth, transform a historically white-owned sector to one more representative of the country's population, issue permits quickly and implement legislation, the South African government has an unenviable task. Operation Phakisa is all about “hurrying up” the biodiversity-based economy to deliver development priorities but it could well be that a slowing down of the process is what is needed right now - to enable genuine inclusion, to bring in a diversity of voices, to set in place appropriate governance mechanisms, to identify local development and conservation priorities, and, importantly, to challenge current trade and intellectual property models – and thus to bring about the

transformative shift required to address the dual crises of social inequality and biodiversity loss. The principled nature of these actions makes them applicable not only to the South African context, but to all countries faced with implementing ABS requirements, and revisioning them to be fit for purpose.

Aligning a more inclusive agenda with those centered on decolonizing science and innovation (Nordling, 2018) could set important precedents for the global South, especially given the wealth of decentralized, diverse and locally applicable knowledge approaches that already exist among Indigenous peoples and the small-scale farmers, fishers, pastoralists, forest dwellers and women who are actively and innately practising their own solutions that support the conservation and sustainable use of biodiversity. Together with opportunities opening through the post 2020 Global Biodiversity Framework, such approaches could reconceptualize benefit sharing to enable long-overdue recognition for other ways of knowing and being that move beyond knee-jerk responses to biopiracy, that place Indigenous peoples and local communities at the center, that ensure more equitable conditions of access, use, and ownership, and that stimulate innovations to address the escalating ecological, social and economic crises that we face.

CRediT authorship contribution statement

Rachel Wynberg: Conceptualization, Methodology, Research, Data curation, Analysis, Writing and editing, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Acknowledgements

This work was supported by Grant 84429 of the South African Research Chairs Initiative of the Department of Science and Innovation and National Research Foundation of South Africa.

References

- ACB, 2008. Knowledge Not for Sale – Umckaloabo and the Pelargonium Patent challenges, A Briefing Paper.
- Chennells Albertyn, 2010. Letter to the Director General, Department Water and Environmental Affairs, 11 October 2010.
- Arnold, J.E.M., Ruiz-Pérez, M., 2001. Can non-timber forest products match tropical forest conservation and development objectives? *Ecol. Econ.* 39, 437–447. [https://doi.org/10.1016/S0921-8009\(01\)00236-1](https://doi.org/10.1016/S0921-8009(01)00236-1).
- Bagley, M.A., 2018. De-materializing genetic resources: synthetic biology, intellectual property and the ABS bypass. In: *Routledge Handbook of Biodiversity and the Law*. Routledge, pp. 219–236.
- Barnett, A., 2001. In Africa the Hoodia cactus keeps men alive. Now its secret is “stolen” to make us thin, 17 June, *The Observer*. <http://www.guardian.co.uk/world/2001/jun/17/internationaleducationnews.businessofresearch>. (Accessed 13 August 2022).
- Belcher, B., Schreckenberg, K., 2007. Commercialisation of non-timber forest products: a reality check. *Dev. Policy Rev.* 25 (3), 355–377. <https://doi.org/10.1111/j.1467-7679.2007.00374.x>.
- Berlin, B., Berlin, E.A., 2004. Community autonomy and the Maya ICBG project in Chiapas, Mexico: how a bioprospecting project that should have succeeded failed. *Hum. Organ.* 63 (4), 472–486. <https://doi.org/10.17730/humo.63.4.xp2dpuh204b0h61b>.
- Berne Declaration and Natural Justice, 2010. Dirty business for clean skin: Nestlé's rooibos robbery in South Africa, Briefing paper. <https://www.cbd.int/abs/side-events/resumed-abs-9/id2114-berne-policy-brief.pdf>.
- Birner, R., 2018. Bioeconomy concepts. In: Lewandowski, I. (Ed.), *Bioeconomy*. Springer, Stuttgart, pp. 17–38.
- Blasiak, R., Jouffray, J.-B., Wabnitz, C.C., Sundström, E., Österblom, H., 2018. Corporate control and global governance of marine genetic resources. *Sci. Adv.* 4 <https://doi.org/10.1126/sciadv.aar5237>.
- Blom, W.A.M., Abrahamse, S.L., Bradford, R., Duchateau, G.S.M.J.E., Theis, W., Orsi, A., 2011. Effects of 15-d repeated consumption of Hoodia gordonii purified extract on safety, ad libitum energy intake, and body weight in healthy, overweight women: a randomized controlled trial. *Am. J. Clin. Nutr.* 94, 1171–1181. <https://doi.org/10.3945/ajcn.111.020321>.
- Bond, M.R., Scott, D., 2020. Digital biopiracy and the (dis) assembling of the Nagoya Protocol. *Geoforum* 117, 24–32. <https://doi.org/10.1016/j.geoforum.2020.09.001>.
- Brendler, T., 2021. From bush medicine to modern phytopharmaceutical: a bibliographic review of devil's claw (*Harpagophytum* spp.). *Pharmaceuticals* 14, 726. <https://doi.org/10.3390/ph14080726>.
- Brendler, T., Brinckmann, J.A., Feiter, U., Gericke, N., Lang, L., Pozharitskaya, O.N., Shikov, A.N., Smith, M., Van Wyk, B.E., 2021. Sceletium for managing anxiety, depression and cognitive impairment: a traditional herbal medicine in modern-day regulatory systems. *Curr. Neuropharmacol.* 19 (9), 1384–1400.
- Brush, S., 2007. Farmers' rights and protection of traditional agricultural knowledge. *World Dev.* 35 (9), 1499–1514. <https://doi.org/10.1016/j.worlddev.2006.05.018>.
- Carney, J.A., Rosomoff, R.N., 2010. In the Shadow of Slavery: Africa's Botanical Legacy in the Atlantic World. University of California Press, Berkeley, CA.
- CBD, 1992. Convention on Biological Diversity, Rio De Janeiro, 5 June 1992. <https://www.cbd.int/convention/text/>.
- Chen, W., Van Wyk, B.-E., Vermaak, I., Viljoen, A.M., 2012. Cape aloes—a review of the phytochemistry, pharmacology and commercialisation of *Aloe ferox*. *Phytochem. Lett.* 5, 1–12. <https://doi.org/10.1016/j.phytol.2011.09.001>.
- Chennells, R., 2013. Traditional knowledge and benefit sharing after the Nagoya Protocol: three cases from South Africa. *Law Environ. Dev. J.* 9 (1), 163.
- Chinsembu, W.W., Chinsembu, K.C., 2020. 'Poisoned chalice': law on access to biological and genetic resources and associated traditional knowledge in Namibia. *Resources* 9 (7), 83. <https://doi.org/10.3390/resources907083>.
- Coombe, R.J., Ives, S., Huizenga, D., 2014. The social imaginary of geographical indicators in contested environments: the politicized heritage and racialized landscapes of South African rooibos tea. In: David, M., Halbert, D. (Eds.), *Sage Handbook on Intellectual Property*. Sage Publications, Thousand Oaks, CA, pp. 224–237.
- Costanza, R., et al., 1997. The value of the world's ecosystem services and natural capital. *Nature* 387, 253–260.
- Crosby Jr., A.W., 1972. *The Columbian Exchange. Biological and Cultural Consequences of 1492*. Greenwood Press, Westport, Connecticut.
- Crouch, N.R., Douwes, E., Wolfson, M.M., Smith, G.F., Edwards, T.J., 2008. South Africa's bioprospecting, access and benefit-sharing legislation: current realities, future complications, and a proposed alternative. *S. Afr. J. Sci.* 104 (9–10), 355–366.
- CSIR and South African San Council Benefit-sharing Agreement, 2004.
- DAFF, 2016. A Profile of the South African Rooibos Tea Market Value Chain. Department of Agriculture, Forestry and Fisheries, Directorate Marketing, Pretoria. <https://www.nda.agric.za/doiDev/sideMenu/Marketing/Annual%20Publications/Commodity%20Profiles/field%20crops/Rooibos%20Tea%20Market%20Value%20Chain%20Profile%202016.pdf>. (Accessed 16 December 2021).
- DEA, 2014. Traditional Knowledge Associated With Rooibos and Honeybush Species in South Africa. Siyanda Samahlubi Consulting for Department of Environmental Affairs, Pretoria. https://www.dffe.gov.za/sites/default/files/reports/traditionalknowledge_rooibosandhoneybushspecies_report.pdf.
- DEA, 2016. National Biodiversity Economy Strategy. Department of Environmental Affairs, Republic of South Africa.
- DFPE, 2022. Payment of benefits from rooibos to San and Khoi communities a milestone for industrywide collaboration, 14 July 2022. https://www.dffe.gov.za/mediarelease/san.khoi.communities_rooibosbenefits.
- Dove, M.R., 1995. Political versus techno-economic factors in the development of nontimber forest products: lessons from a comparison of natural and cultivated rubbers in Southeast Asia (and South America). *Soc. Nat. Resour.* 8, 193–208. <https://doi.org/10.1080/08941929509380914>.
- Downes, D.R., Laird, S., 1998. Innovative Mechanisms for Sharing Benefits of Biodiversity and Related Knowledge. Case Studies on Geographical Indications, Trademarks and Databases. UNCTAD Biotrade Initiative (Contributions by J. Casey, G. Dutfield, T.D. Mays and R. Wynberg).
- Draho, P., 2003. Intellectual property engineering: the role of the chemical, pharmaceutical and biotechnology industries. In: *Intellectual Property and Biological Resources*. Marshall Cavendish, Singapore.
- Dutfield, G., 2000. Intellectual Property Rights, Trade and Biodiversity. IUCN and Earthscan, London.
- Dutfield, G., 2009. Chapter 4. Protecting the rights of indigenous peoples: can prior informed consent help? In: Wynberg, R., Chennells, R., Schroeder, D. (Eds.), *Indigenous Peoples, Consent and Benefit-sharing: Learning From the San–Hoodia Case*. Springer, Berlin, pp. 53–67.
- Dutfield, G., Suthersanen, U., 2019. Traditional knowledge and genetic resources: observing legal protection through the lens of historical geography and human rights. *Washington Law J.* 58, 399.
- Dutfield, G., Wynberg, R., Laird, S., Ives, S., 2020. Benefit sharing and traditional knowledge: unsolved dilemmas for implementation. The challenge of attribution and origin: traditional knowledge and access and benefit sharing. Policy Brief, Voices for BioJustice. <https://www.voices4biojustice.org/wp-content/uploads/2017/12/Traditional-Knowledge-Policy-Brief-1.pdf>. (Accessed 9 December 2021).
- Feiter, U., 2019. The Development of a Treatment for Bronchitis Based on a Plant from South Africa (Unpublished).

- Ferguson, J., 1994. *The Anti-politics Machine. "Development", Depoliticization, and Bureaucratic Power in Lesotho*. University of Minnesota Press, Minneapolis, London, p. 320.
- Forest Peoples Programme, International Indigenous Forum on Biodiversity, Indigenous Women's Biodiversity Network, Centres of Distinction on Indigenous and Local Knowledge, Secretariat of the Convention on Biological Diversity, 2020. *Local Biodiversity Outlooks 2: The Contributions of Indigenous Peoples and Local Communities to the Implementation of the Strategic Plan for Biodiversity 2011–2020 and to Renewing Nature and Cultures. A Complement to the Fifth Edition of Global Biodiversity Outlook*. Forest Peoples Programme, Moreton-in-Marsh, England. www.localbiodiversityoutlooks.net.
- Gamez, R., 2007. The link between biodiversity and sustainable development: lessons from INBIO's bioprospecting programme in Costa Rica. In: McManis, C. (Ed.), *Biodiversity and the Law: Intellectual Property, Biotechnology and Traditional Knowledge*. Earthscan, London, pp. 77–90.
- Gericke, N., Viljoen, A., 2008. *Scetulum*—a review update. *J. Ethnopharmacol.* 119, 653–663. <https://doi.org/10.1016/j.jep.2008.07.043>.
- Gollin, M.A., 1993. An intellectual property rights framework for biodiversity prospecting. In: Reid, W.V., Laird, S.A., Meyer, C.A., Gámez, R., Sittenfeld, A., Janzen, D.H., Gollin, M.A., Juma, C. (Eds.), *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development*. World Resources Institute, Instituto Nacional de Biodiversidad. Rainforest Alliance and African Centre for Technology Studies, Washington DC, pp. 159–197.
- Government of Namibia, 2014. *Namibia's Second National Biodiversity Strategy and Action Plan, 2013–2022*. Ministry of Environment and Tourism.
- Government of South Africa, 2018. Address by President Cyril Ramaphosa at the launch of the Biodiversity Economy Operation Phakisa, Kalahari Waterfront, Thohoyandou, Limpopo, 25 Aug 2018. <http://www.thepresidency.gov.za/speeches/address-president-cyril-ramaphosa-launch-biodiversity-economy-operation-phakisa%2C-kalahari>. (Accessed 16 December 2021).
- Greene, S., 2004. Culture as politics, culture as property in pharmaceutical bioprospecting (Indigenous People Incorporated?). *Curr. Anthropol.* 45 (2), 2111–2138.
- Hamilton, C., 2006. Biodiversity, biopiracy and benefits: what allegations of biopiracy tell us about intellectual property. *Dev. World Bioethics* 6 (3), 158–173.
- Hammond, E., 2017. Gene sequences and biopiracy: protecting benefit-sharing as synthetic biology changes access to genetic resources. briefing paper 93, Third World Network. www.twn.my/title2/briefing_papers/No93.pdf. (Accessed 14 August 2022).
- Hammond, E., 2020. Finding traditional knowledge's place in the digital sequence information debate. Discussion paper, Third World Network. www.twn.my/title2/briefing_papers/twn/TWB_EHamm_Jul2020_D03.pdf. (Accessed 12 August 2022).
- HG&H, the South African San Council, 2011. Review of the Benefit Sharing Agreement Between HG&H Pharmaceuticals (Pty) Ltd, Niche Botanicals (Pty) Limited H.L. Hall and Sons Limited. A Benefit Sharing Agreement as Contemplated by the South African Biodiversity Act 10 of 2004 and the Regulations Promulgated Thereunder (22 February).
- Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the convention on biological diversity. <http://www.cbd.int/abs/text/>, 2010–. (Accessed 9 December 2021) (Nagoya, 29 October).
- IPBES, 2019. In: Brondizio, E.S., Settle, J., Díaz, S., Ngo, H.T. (Eds.), *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. IPBES secretariat, Bonn, Germany. <https://ipbes.net/global-assessment>.
- Ives, S.F., 2017. *Steeped in Heritage: The Racial Politics of South African Rooibos Tea*. Duke University Press.
- Ives, S., Wynberg, R., Duffield, G., 2020. Rooibos settlement omits other marginalized people. *Nature* 577, 318. <https://doi.org/10.1038/d41586-020-00056-x> (Correspondence, 14 January 2020).
- Jimenez, A., Delgado, D., Merino, R., Argumedo, A., 2022. A decolonial approach to innovation? Building paths towards Buen Vivir. *J. Dev. Stud.* 1–18. <https://doi.org/10.1080/00220388.2022.2043281>.
- Joubert, E., Joubert, M.E., Bester, C., De Beer, D., De Lange, J.H., 2011. Honeybush (*Cyclopia* spp.): from local cottage industry to global markets—the catalytic and supporting role of research. *S. Afr. J. Bot.* 77 (4), 887–907. <https://doi.org/10.1016/j.sajb.2011.05.014>.
- Kloppenborg, J., 1988. *First the Seed: The Political Economy of Plant Biotechnology*. Yale University Press, New Haven, CT.
- Kupferschmidt, K., 2018. Biologists raise alarm over changes to biopiracy rules. Plan would bring genetic sequences under Nagoya Protocol. *Science* 361 (6397), 14.
- Laird, S., Wynberg, R., 2008. Access and benefit sharing in practice: trends in partnerships across sectors. In: *Technical Series No. 38. CBD Secretariat, Montreal*.
- Laird, S., Wynberg, R., 2018. A fact-finding and scoping study on digital sequence information on genetic resources in the context of the Convention on Biological Diversity and the Nagoya Protocol. www.cbd.int.
- Laird, S., Wynberg, R., 2021. Connecting the Dots ... Biodiversity Conservation, Sustainable Use and Access and Benefit Sharing. With a Focus on Cameroon, Madagascar, Namibia, and South Africa. GIZ, People and Plants International, University of Cape Town, Voices for Biojustice.
- Laird, S., Wynberg, R., Rourke, M., Humphries, F., Ruiz Muller, M., Lawson, C., 2020. Rethink the expansion of access and benefit sharing. *Science* 367 (6483), 1200–1202. <https://doi.org/10.1126/science.aba9609>.
- Lightfoot, S., 2016. *Global Indigenous Politics: A Subtle Revolution*. Routledge.
- Low, C., 2007. Different histories of buchu: Euro-American appropriation of San and Khoekhoe knowledge of buchu plants. *Environ. Hist.* 13 (3), 333–361. <https://doi.org/10.3197/096734007X228309>.
- McAfee, K., 1999. Selling nature to save it? Biodiversity and green developmentalism. *Environ. Plan. D Soc. Space* 17 (2), 133–154. <https://doi.org/10.1068/d170133>.
- McDermott, M., Mahanty, S., Schreckenbach, K., 2013. Examining equity: a multidimensional framework for assessing equity in payments for ecosystem services. *Environ. Sci. Pol.* 33, 416–427. <https://doi.org/10.1016/j.envsci.2012.10.006>.
- Mellet, P.T., 2020. *The Lie of 1652. A Decolonised History of Land*. Tafelberg, Cape Town.
- Michiels, F., Feiter, U., Paquin-Jaloux, S., Jungmann, D., Braun, A., Sayoc, M.A.P., Armengol, R., Wyss, M., David, B., 2021. Facing the harsh reality of access and benefit sharing (ABS) legislation: an industry perspective. *Sustainability* 14 (1), 277.
- Modise, A., 2018. Strengthening indigenous governance, benefit sharing and capacity building for traditional phytomedicines. In: *ABS is Genetic Resources for Sustainable Development*. UNDP.
- Morris, C., 2016. Royal pharmaceuticals. Bioprospecting, rights and traditional authority in South Africa. *Am. Ethnol.* 43 (3), 525–539. <https://doi.org/10.1111/amet.12344>.
- National Khoisan Council, Cederberg Belt Indigenous Farmers Representatives/Nasionale Khoi en San Raad, Verteenwoordigers van die Sederberg Strook se Inheemse Boere, 2019. *The Khoi People's Rooibos Biocultural Community Protocol*. <https://natu.raljustice.org/wp-content/uploads/2020/04/NJ-Rooibos-BCP-Web.pdf>.
- Neumann, R.P., Hirsch, E., 2000. Commercialisation of Non-timber Forest Products: Review and Analysis of Research. Bogor, CIFOR.
- Nordling, L., 2018. How decolonization could reshape South African science. *Nature* 554 (7690), 159–163.
- Nott, M., 2019. *Benefit Sharing and Environmental Sustainability in Policy and Practice: The Commercialisation of the Resurrection Bush (Myrothamnus flabellifolia) in Southern Africa*. University of Cape Town, Cape Town, South Africa (Unpublished Master's thesis).
- Oldham, P., Hall, S., Forero, O., 2013. Biological diversity in the patent system. *PLoS One* 8 (11), e78737. <https://doi.org/10.1371/journal.pone.0078737>.
- Orozco, D., Poonamallee, L., 2014. The role of ethics in the commercialization of Indigenous knowledge. *J. Bus. Ethics* 119 (2), 275–286.
- Penn, N., 2006. *The Forgotten Frontier: Colonist and Khoisan on the Cape's Northern Frontier in the 18th Century*. Ohio University Press, Athens OH.
- Pikoli, Z., 2019. Traditional and Khoi-San Leadership Act 'brings back apartheid Bantustans', say activists, 8 December 2019, Daily Maverick. <https://www.dailymaverick.co.za/article/2019-12-08-traditional-and-khoi-san-leadership-act-brings-back-apartheid-bantustans-say-activists/>.
- Posey, D.A., Duffield, G., 1996. *Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities*. IDRC.
- Raimondo, D., Von Staden, L., 2009. Patterns and trends in the red list of South African plants. In: Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A., Manyama, P.A. (Eds.), *Red List of South African Plants 2009*, Strelitzia 25. South African National Biodiversity Institute, Pretoria.
- Reid, W.V., Laird, S.A., Meyer, C.A., Gámez, R., Sittenfeld, A., Janzen, D.H., Gollin, M.A., Juma, C. (Eds.), 1993. *Biodiversity Prospecting: Using Genetic Resources for Sustainable Development*. World Resources Institute, Instituto Nacional de Biodiversidad. Rainforest Alliance and African Centre for Technology Studies, Washington DC, pp. 159–197.
- Reinten, E.Y., Coetzee, J.H., van Wyk, B.-E., 2011. The potential of South African indigenous plants for the international cut flower trade. *S. Afr. J. Bot.* 77, 934–946. <https://doi.org/10.1016/j.sajb.2011.09.005>.
- Robinson, D.F., 2010. *Confronting Biopiracy. Challenges, Cases and International Debates*. Earthscan, London, New York (190 pp.).
- Robinson, D.F., Abdel-Latif, A., Roffe, P. (Eds.), 2017. *The WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore*. Taylor & Francis.
- Rooibos Council, 2020. *Rooibos Industry Information Sheet*. <https://sarooibos.co.za/wp-content/uploads/2020/12/SARC-2020-Information-sheet.pdf>. (Accessed 16 December 2021).
- Ruiz Muller, M., 2015. *Genetic Resources as Natural Information: Implications for the Convention on Biological Diversity and Nagoya Protocol*. Routledge.
- Safirin, S., 2004. Hyperownership in a time of biotechnological promise: the international conflict to control the building blocks of life. *Am. J. Int. Law* 98 (4), 641–685. <https://doi.org/10.2307/3216691>.
- Sanderson, J., Wiseman, L., Stamboulakis, D., 2018. Certified ABS: the Union for Ethical Biotrade and the use of trade and certification marks to encourage and facilitate behaviour change. In: *Biodiversity, Genetic Resources and Intellectual Property*. Routledge, pp. 220–250.
- Schroeder, D., Chennells, R., Louw, C., Snyders, L., Hodges, T., 2020. The rooibos benefit-sharing agreement – breaking new ground with respect, honesty, fairness and care. *Camb. Q. Healthc. Ethics* 29, 285–301. <https://doi.org/10.1017/S0963180119001075>.
- Shackleton, C.M., Pullanikkatil, D., 2019. Considering the links between non-timber forest products and poverty alleviation. In: *Poverty Reduction Through Non-timber Forest Products*. Springer, Cham, pp. 15–28.
- Shackleton, S., Shackleton, S., 2004. The importance of non-timber forest products in rural livelihood security and as safety nets: a review of evidence from South Africa. *S. Afr. J. Sci.* 100 (11), 658–664.
- Shackleton, S., Paumgarten, F., Kassa, H., Husselman, M., Zida, M., 2011. Opportunities for enhancing poor women's socioeconomic empowerment in the value chains of three African non-timber forest products (NTFPs). *Int. For. Rev.* 13 (2), 136–151. <https://doi.org/10.1505/146554811797406642>.

- Smyth, S.J., Macall, D.M., Phillips, P.W.B., de Beer, J., 2020. Implications of biological information digitization: access and benefit sharing of plant genetic resources. *J. World Intellect. Prop.* 23 (3–4), 267–287. <https://doi.org/10.1111/jwip.12151>.
- Sullivan, S., 2002. How sustainable is the communalising discourse of 'new' conservation? In: Chatty, D., Colchester, M. (Eds.), *Conservation and Mobile Indigenous People*. Berghahn Press, Oxford, pp. 158–187.
- Sunderland, T.C.H., Harrison, S.T., Ndoye, O., 2004. Commercialisation of nontimber forest products in Africa: history, context and prospects. In: Sunderland, T., Ndoye, O. (Eds.), *Forest Products, Livelihoods and Conservation. Case Studies of Non-timber Forest Product Systems, Volume 2 – Africa*. Centre for International Forestry Research, Bogor, Indonesia, pp. 1–24.
- Taylor, M., Wynberg, R., 2008. Regulating access to South Africa's biodiversity and ensuring the fair sharing of benefits from its use. *S. Afr. J. Environ. Law Policy* 15 (2), 217–243.
- ten Kate, K., Laird, S.A., 1999. *The Commercial Use of Biodiversity: Access to Genetic Resources and Benefit-sharing*. Earthscan.
- UNDP, 2018. *ABS Is Genetic Resources for Sustainable Development*. UNDP.
- van Niekerk, J., Wynberg, R., 2012. The trade in *Pelargonium sidoides*. Rural livelihood relief or bounty for the bio-buccaneers? *Dev. South. Afr.* 29 (4), 530–547. <https://doi.org/10.1080/0376835X.2012.715440>.
- van Niekerk, J., Wynberg, R., 2019. The trade in *Pelargonium sidoides*: rural livelihood relief or bounty for bio-buccaneers? In: Jacobs, P.T. (Ed.), *Equitable Rural Socioeconomic Change: Land, Climate Dynamics, Technological Innovation*. HSRC Press, p. 103.
- Volk, O.H., 1964. Zur Kenntnis von *Harpagophytum procumbens* DC. *Deutscher Apotheker-Zeitung* 104, 573–576.
- West, S., 2012. Institutionalised exclusion: the political economy of benefit sharing and intellectual property. *Law Environ. Dev. J.* 8 (1), 19–42. <http://www.lead-journal.org/content/12019.pdf>.
- WIPO, 2022. Disputing a name, developing a geographical indication. <http://www.wipo.int/ipadvantage/en/details.jsp?id=2691>. (Accessed 26 June 2022).
- Wynberg, R., 2002. Study on the Rooibos and Honeybush Industries in South Africa for the Identification of Target Groups Which Should Benefit From Fair Trade. Report Prepared for Fair Trade Assistance. November. Project Number 02/062/FO (FTF-UK 2002) 22/5/2002.
- Wynberg, R., 2004. Rhetoric, realism and benefit-sharing—use of traditional knowledge of Hoodia species in the development of an appetite suppressant. *World J. Intellect. Prop.* 6 (7), 851–876. <https://doi.org/10.1111/j.1747-1796.2004.tb00231.x>.
- Wynberg, R., 2006a. Identifying Pro-poor, Best Practice Models of Commercialisation of Southern African Non-timber Forest Products. University of Strathclyde, Glasgow (PhD thesis, 343 pp.).
- Wynberg, R., 2006b. Product Rationale Paper for Fairly Traded Rooibos Tea. Prepared for Fairtrade Labelling Organisations International (FLO).
- Wynberg, R., 2017. Making sense of access and benefit sharing in the rooibos industry: towards a holistic, just and sustainable framing. *S. Afr. J. Bot.* 110, 39–51. <https://doi.org/10.1016/j.sajb.2016.09.015>.
- Wynberg, R., 2018. Chapter 14: one step forward, two steps back? Implementing access and benefit-sharing legislation in South Africa. In: McManis, Charles R., Ong, Shack (Eds.), *Routledge Handbook of Biodiversity and the Law*. Routledge, pp. 198–218.
- Wynberg, R., 2019. San and Khoi claim benefits from rooibos, 1 November 2019, *Mail & Guardian*. <https://mg.co.za/article/2019-11-01-00-san-and-khoi-claim-benefits-from-rooibos/>. (Accessed 9 December 2021).
- Wynberg, R., 2020. Rooibos: A Testing Ground for ABS in South Africa. University of Cape Town, Voices for Biojustice.
- Wynberg, R., Chennells, R., 2009. Chapter 6: green diamonds of the South. A review of the San–Hoodia case. In: Wynberg, R., Chennells, R., Schroeder, D. (Eds.), *Indigenous Peoples, Consent and Benefit-sharing: Learning From the San–Hoodia Case*. Springer, Berlin, pp. 89–126.
- Wynberg, R., Custers, S., 2005. Determining a Fair Price and Equitable Benefit for Small-scale Rooibos Tea Producers. An Analysis of the Costing and Pricing of Small-scale Production of Organic and Fair Trade Rooibos, and Benefit Flows Along the Rooibos Value Chain. Report Prepared for Fair Trade Assistance, Netherlands.
- Wynberg, R., Hauck, M., 2014. People, power and the coast: a conceptual framework for understanding and implementing benefit sharing. *Ecol. Soc.* 19 (1), 27.
- Wynberg, R., Hughes, J., Baas, A., Bell, S., Sharp, J., Hanks, K., Myanti, M., 1994. Policy Options for Optimising the Use of Natural Resources in the Citrusdal Zone, Western Cape Province. Co-author, Compiler and Editor of Report. EEU Report No. 15/94/126 (Work commissioned by the Land and Agriculture Policy Centre).
- Wynberg, R., Chennells, R., Schroeder, D. (Eds.), 2009a. *Indigenous Peoples, Consent and Benefit-sharing: Learning from the San–Hoodia Case*. Springer, Berlin.
- Wynberg, R., Silveston, J., Lombard, C., 2009b. Value adding in the Southern African natural products sector: how much do patents matter?. In: *The Economics of Intellectual Property in South Africa*. World Intellectual Property Organisation, Geneva, ISBN 978-92-805-1794-1, pp. 18–55.
- Wynberg, R., Laird, S., van Niekerk, J., Kozanayi, W., 2015. Formalization of the natural product trade in Southern Africa: unintended consequences and policy blurring in biotrade and bioprospecting. *Soc. Nat. Res. Int. J.* 28, 559–574. <https://doi.org/10.1080/08941920.2015.1014604>.