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INCLUSIVE DEVELOPMENT IN THE SOUTH AFRICAN CANNABIS INDUSTRY: ASSESSING THE CHALLENGES

The Institute for Economic Justice

The IEJ is the commissioning party of this report which forms part of research support for COSATU's participation in a selection of industrial policy Masterplans processes. The industrial policy Masterplan processes in South Africa are underway with sectors progressing at different paces. Discussions were designed to promote industrial democracy in industry and in labour market policy, to promote and develop industrial capacity, create jobs, define trade policy interests, and advance the decent work agenda. Research focuses on these aims, as well as the labour implications of selected Masterplans – a Just Transition, skills and continuous learning, sustainable enterprise development, inclusive ownership and governance – and designed to promote an understanding of the selected sectors, effective participation in policy engagements, and trade unions defining their own ambitions for industrial strategy and labour market negotiations.

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EXECUTIVE SUMMARY

1. Purpose of the report

This report contributes to debates about policy reform and industrial strategy for the South African cannabis industry. It focuses on two key challenges: first, achieving forms of industrial growth and international competitiveness that create decent work; second, building an inclusive cannabis economy in which traditional cannabis growers and small enterprises can participate. The report reviews international and domestic trends in cannabis markets and regulation, covering three broad segments: medical, industrial and adult-use[1] cannabis. Drawing on interviews with industry stakeholders, it identifies near and long-term challenges facing the industry and develops recommendations for how policymakers might address them. The report does not seek to comprehensively cover all issues concerning the growth of legal cannabis markets. There are a range of important policy issues not addressed here, including fiscal policy, public health, and criminal justice. The economic development imperatives relating to growth, job creation and widening participation in the formal cannabis industry addressed in this report may in some instances be in tension with imperatives in these other policy areas, and careful consideration must be given to balancing them. The research in the report is exploratory in nature, and hampered by the limited publicly available data on the cannabis industry. All findings and policy recommendations should be taken as provisional, and a precursor to more rigorous research required for effective evidence-based policymaking.

Industrial cannabis plantation farm green house.
(Photo: Sergio Azenha / Alamy Stock Photo)

1. Sometimes referred to as 'recreational', we prefer to use the term adult-use to reflect the fact that the reasons for the use of cannabis are wider than simply recreation.

There are high expectations for the future of the South African cannabis industry. There has been a surge of investment in export-oriented medical cannabis production, with over 70 cultivation licences awarded to date and more awaiting approval.

2. Context: The growth of a global cannabis industry

Recent years have seen dramatic shifts in the regulation of cannabis. By 2021, 48 countries had legalised medical cannabis to some degree (New Frontier Data, 2021). A smaller but growing number have either decriminalised or legalised adult-use cannabis. Many governments have legalised or significantly liberalised cultivation of industrial cannabis (hemp). Excluding the hemp market, legal sales still only account for an estimated 6% of the US$415 billion global cannabis market (New Frontier Data, 2021), but this is forecast to grow rapidly. Legalisation reforms are driven by multiple factors. These include changing scientific opinion on the harmfulness of cannabis use, and its medical applications (Nutt, 2020). There have also been shifts in many governments' attitudes to drug control, with recognition that prohibition has failed to significantly limit either the supply of or demand for cannabis, while instead generating social ills such as revenues for organised crime and criminalisation of harmless users (Rolles and Slade, 2022). Many governments also see cannabis legalisation as an economic opportunity, generating jobs and tax revenues. There are export market opportunities in medical cannabis, which is an advanced, technology-intensive form of high-value horticulture (Prohibition Partners, 2021). Hemp can be used for a range of important industrial and consumer goods applications, and has potential as an environmentally-friendly substitute for several materials, and as a means of carbon sequestration and remediating polluted soils. The growth of a formal cannabis industry offers important potential development opportunities for regions with favourable cultivation conditions. This includes opportunities for inclusive growth – growth that improves equity alongside widening participation and agency in the economy (Hickey et al., 2015) – involving participation of marginalised communities that cultivate cannabis for illegal markets (Bewley-Taylor et al., 2020).

3. South Africa's cannabis policy challenges

The cannabis economy in South Africa has also been undergoing rapid change. Private[2] adult-use cannabis has been decriminalised following a 2018 Constitutional Court ruling. Medical cannabis can now be legally produced with licences from the South African Health Products Regulatory Authority (SAHPRA), and hemp with licences from the Department of Agriculture, Land Reform and Rural Development (DALRRD). The draft Cannabis for Private Purposes Bill (CPPB) currently going through Parliament maintains the illegality of commercial adult-use cannabis, but proposes future legislation for its legalisation. Cannabis policy is being coordinated through the multi-stakeholder National Cannabis Masterplan (NCMP) Process, initiated in 2021 (DALRRD, 2021). There are high expectations for the future of the South African cannabis industry. There has been a surge of investment in export-oriented medical cannabis production, with over 70 cultivation licences awarded at the time of writing and more awaiting approval. There are significant potential opportunities for job creation, industrial development, and export revenue generation. Government and many stakeholders view cannabis legalisation as also providing an important opportunity for inclusive growth. By some estimates, as many as 900,000 people may be engaged in illegal cannabis cultivation (DALRRD, 2021), though reliable data is difficult to obtain. Cannabis contributes to livelihoods in many marginalised rural areas, in particular the Pondoland region in Eastern Cape (Fortune, 2021; Kepe, 2003; Manu et al., 2021). The NCMP seeks to incorporate these 'traditional growers' into formal supply chains. President Cyril Ramaphosa stated in the 2022 State of the Nation Address that cannabis could create 130,000 formal jobs (Roelf, 2022).

2. Meaning for personal consumption in small quantities, rather than commercial activity.

This report argues there is a risk that the challenges of realising these opportunities are underestimated. These challenges can be grouped into five categories:

Establishing a competitive position in global cannabis markets

It is extremely difficult to access medical cannabis export markets. Cultivators require advanced precision agriculture capabilities and access to patient capital. Meeting licensing requirements domestically is time consuming, complicated, and expensive. Export markets are a complex patchwork of varied and evolving regulations. There are major regulatory obstacles to accessing key European markets. Export growth requires rapid action to streamline regulatory processes, align with international standards, improve market access, and address critical gaps in infrastructure, services, and skills.

Avoiding the commodity trap

Other emerging cannabis supplier nations with similar factor cost and climatic advantages to South Africa are moving quickly, and international markets for dry flowers are expected to become increasingly competitive, if not over-supplied (Prohibition Partners, 2021; New Frontier Data, 2021). A longer-term risk is being positioned in international cannabis markets as an easily replaceable supplier of undifferentiated products subject to continual downward price pressure – a commodity trap (Ghodsi and Stehrer, 2018). This could jeopardise jobs and investment, and create downward pressures on wages and working conditions. Avoiding this necessitates strategic support for innovation to enable specialisation and upgrading into more specialised value chain activities that generate innovation rents (Kaplinsky and Morris, 2016). In such activities, the South African cannabis industry will face 'latecomer' challenges relative to firms in mature northern cannabis markets.

Social and environmental upgrading

Realising the developmental potential of cannabis means adopting principles of 'decent work' and ecological sustainability, and pursuing social and environmental upgrading within the South African cannabis industry (Barrientos et al., 2011; Marchi de Marchi et al., 2019). Some forms of cannabis cultivation can have a high ecological footprint, particularly indoor cultivation systems using artificial light (Kay, 2022; Madhusoodanan, 2019). If poorly regulated, cannabis production could exacerbate problems with water stress and slow progress to net zero emissions. The cannabis industry must also avoid the industrial relations problems historically associated with South African horticulture and viticulture. Decent work principles can support productivity growth, while safeguarding the international reputation of South African cannabis. Mirroring trends seen in other agri-food products, consumer concern about supply chain ethics and sustainability is anticipated to be an increasingly significant feature of the global cannabis industry (Bennett, 2021; Kay et al., 2020). These challenges must be addressed through careful forms of multi-stakeholder regulation, involving Labour, and collective action among industry actors.

Creating an inclusive cannabis industry with opportunities for traditional growers and small enterprise

To advance social equity, the cannabis industry must include traditional growers whose livelihoods rely on cannabis production, and who have suffered historically from prohibition. These livelihoods are threatened by legalisation. Barriers to entry in legal cannabis production are high. Legal adult-use markets appear to offer the best opportunities for inclusive development, but traditional growers would face some severe competitive disadvantages. It will be difficult for small enterprises – particularly in marginalised rural areas – to participate without far-reaching support and creative regulation. In more mature North American markets, there are mounting concerns about consolidation and 'corporate capture', but also a growing range of innovative proposals for social equity regulations to help address them (Kilmer et al., 2021; Rolles and Slade, 2022). Future cannabis regulations must prioritise inclusion alongside commercial and public health imperatives.

Future cannabis regulations must prioritise inclusion alongside commercial and public health imperatives.

Leveraging domestic demand

Domestic markets will be crucial to drive growth and inclusion. Medical cannabis appears the only significant near-term export opportunity, and barriers to export market participation are extremely high. Domestic adult-use markets are large and segmented and, if legalised and suitably regulated, would likely provide the most accessible opportunities for traditional growers and small enterprises. Domestic markets can also be complementary to export market competitiveness, providing South African firms with opportunities to develop scale and capabilities prior to entering international markets. Having a significant domestic market would increase exporter bargaining power and mitigate risk. While there is significant latent demand, formal domestic markets for medical and adult-use cannabis are held back by the legal and regulatory system. Commercial adult-use cannabis remains prohibited with no clear pathway to legalisation, while medical cannabis is difficult for patients to obtain. Legal reforms to address this should be a key priority. These reforms must balance imperatives for commercial growth and inclusion with public health. In industrial cannabis, domestic markets are also pivotally important because near-term export opportunities appear limited. As opposed to tapping latent demand, the more complex policy challenge here is one of 'market creation' (Mazzucato, 2015) for novel products, involving investment in post-harvest processing and manufacturing, and demand-driven industrial policy interventions in areas such as public procurement (Santiago and Weiss, 2018).

Cannabis crop growing under high powered sodium light bulbs which simulate sunlight. (Photo: Jason Bye / Alamy Stock Photo)

4. Legal and regulatory reform

The most urgent priority in responding to the challenges outlined above is addressing constraints imposed by the current legal and regulatory system. These are hampering the international competitiveness of exporters, holding back growth in domestic markets, and excluding traditional growers.

Adult-use cannabis

Private-use of small amounts of cannabis is decriminalised, but commercial adult-use cannabis remains prohibited under the Drugs & Drug Trafficking Act (Drugs Act). The NCMP recognises the need for adult-use commercialisation, but is vague on how this will be implemented. The draft CPPB is the main legislation pertaining to adult-use cannabis reform. It commits government to creating a legal adult-use market at an unspecified future date, but maintains prohibition and harsh legal penalties. Private-use exceptions discriminate against poorer cannabis users. More coherent legislation enabling a regulated adult-use cannabis market is urgently required. International experiences of adult-use legalisation provide important lessons for how to manage the trade-offs inherent to legalisation. Cannabis can be a harmful substance (Nutt, 2020), and public health is a key concern. Other jurisdictions address this through licensing systems for production, tetrahydrocannabinol (THC)[3] content limits, taxes or price controls to manage demand, restrictions on advertising, controls on sales to young people, and restricting sales to licensed premises, pharmacies, or state-owned dispensaries. A careful balance is required because stricter controls risk perpetuating illegal markets and excluding small enterprises and marginalised groups. Tiered licensing systems with social equity provisions should be pursued.

Medical cannabis

Medical cannabis production licences are costly, complex and time-consuming to obtain. This excludes traditional growers and small enterprises lacking access to capital. The remedy is not necessarily looser licensing arrangements. High standards are required to enter export markets, and accusations of lax regulation or low sanitary and phytosanitary (SPS) controls can jeopardise market access. Exporters would benefit from greater alignment with leading international standards. A solution may be tiered licensing systems with offtake arrangements enabling smaller entrants to supply larger firms adhering to higher standards under close supervision. There may also be areas where licensing conditions can be streamlined without jeopardising standards. For example, under Section 21 of the Medicines Act for access to medical cannabis limit South African patients' access, and are widely viewed as constraining domestic medical cannabis markets.

Industrial cannabis

Though less onerous than medical cannabis production licences, hemp licences also pose major challenges for small enterprises in terms of cost, complexity, and requirements concerning criminal records and formal skills. These requirements relate to efforts to control diversion of industrial cannabis into illegal markets. These risks appear overstated, and licences should be reformed to lower entry barriers. A further difficulty is the requirement that crops must contain less than 0.2% THC. This is a low threshold by international standards, and widely considered difficult to achieve in South African conditions. The threshold could be raised considerably to 1-2% with crops still having limited or no value in adult-use markets due to the lack of a psychoactive effect. Additional difficulties include access to seeds, and the regulatory system preventing the adoption of multi-use (or 'whole plant') cultivation systems, which may have an important role in inclusive rural development.

3. A cannabinoid that is the main psychoactive substance in cannabis.

International drug control treaty obligations

Government's reticence over pursuing less prohibition-orientated cannabis policies is frequently attributed to concerns about adherence to UN drugs control conventions. Government may be taking an overly-conservative approach. International experience shows other countries pursuing more liberal approaches. Legal experts suggest there is scope for differing interpretations of the conventions, and to justify exemptions for regulated adult-use markets in terms of protecting human rights and traditional culture (Riboulet-Zemouli, 2022).

5. Supporting industrial-scale cannabis production

Legal and regulatory reforms must be combined with a range of support measures which address key challenges relating to growth, competitiveness and inclusivity.

Near-term: support international market access

There are potential near-term export opportunities in medical cannabis production, which is labour intensive and has strong linkages to other industrial activities. However, exporters face severe market access challenges. Interviewees expressed concerns about delays obtaining key permits. Lab capacity and competency is widely viewed as a critical bottleneck. Navigating the complex and varying requirements of importing nations' regulators is a major challenge. Particular problems relate to the European Union's (EU) Good Manufacturing Practice (GMP) standard. The EU has mutual recognition agreements (MRAs) with a number of other non-EU cannabis exporters, but South African GMP standards are not recognised. This means licence holders must either obtain EU GMP certification, which is costly and time-consuming, or sell cannabis in bulk under a Good Agricultural and Collection Practice licence to EU-GMP facilities in EU countries where National Competent Authorities' (NCAs) allow this. This disadvantages South African producers in a number of ways. Potential support measures include:

- Pursuing MRAs for South African GMP licences in key export markets, through South Africa's membership of the Pharmaceutical Inspection Co-operation Scheme (PICS).
- A trade advisory group and information hub to help producers navigate international regulations and guide government initiatives to improve market access and ensure South Africa has a voice in future international standardisation processes.
- Increasing laboratory capacity through expediting issuance of licences, or providing funding or incentives for increased capacity where necessary.
- Supporting specialised training programmes for the cannabis industry, building on existing initiatives.
- Streamlining domestic certification and permit issuance through increased capacity at SAHPRA.
- Expanding domestic market opportunities for medical cannabis producers to reduce export dependency and increase bargaining power.

Longer term: support innovation to avoid the commodity trap

Avoiding the commodity trap requires state industrial support and building a sectoral system of innovation (SSI) to promote upgrading into higher value added activities linked to cannabis cultivation.

- A key initial task is research to identify the best industrial development opportunities for targeted support. Though much focus in the NCMP appears to be on building forward linkages into processed and manufactured products, this report suggests there may be important opportunities in backward and horizontal linkages into specialised genetics and the supply of equipment, inputs and services required for cannabis cultivation.

- Addressing these long-term challenges will require support for research and development (R&D), skills development, and developmental financing of investment in key areas. There are a range of existing organisations that can assist, including state research agencies and universities already doing R&D on these topics. There is also a need for new institutions which help overcome coordination problems. Interviewees expressed concern about the fragmentation and incoherency of governance in the cannabis industry. An aim should be to create a unified cannabis regulatory/policy agency with a developmental mandate. Uruguay provides a potentially useful example of this. This would also enable the development of specialist cannabis expertise within the state.
- Related to the above, a representative and well-resourced cannabis industry association may help coordinate the private sector, disseminate information, mobilise resources for shared services, support emerging producers, and promote state-industry dialogue. Industry associations play an important role in many agricultural commodities, and lessons may be learned from successful horticulture sub-sectors such as citrus (Chisoro-Dube and Roberts, 2021). Industry governance forums should also include organised labour, in particular relating to skills development challenges and achieving decent work.

Market creation for the hemp industry

Hemp production differs significantly to medical and adult-use cannabis in terms of challenges with demand. There are many potential applications for hemp, and in the long-term hemp may prove to be the largest cannabis market if environmental policies encourage hemp-based substitutes for materials like cotton, oil-based plastics, and some conventional cement-based building materials through the use of hempcrete.

The Body Shop hemp products.
(Photo: Ed Brown / Alamy Stock Photo)

However, these are relatively novel products, for which the value chain and end markets are undeveloped. South Africa lacks processing and manufacturing capacity to enable cultivators to connect to markets. Interviewees expressed concerns about how hemp producers would sell their crops. Industrial policy support for investment in hemp processing is important, but more fundamentally the challenge is market creation (Mazucatto, 2015; Santiago and Weiss, 2018). The risk is that at present the NCMP is focused on policy support to increase hemp supply while paying insufficient attention to demand. Demand-driven industrial policy measures could include leveraging state procurement, or incentivising substitutions for existing materials. This would need to be informed by research to determine product categories in which such support may be justifiable.

Social and environmental upgrading for decent work and sustainability

Embedding sustainability and decent work in the cannabis industry from an early stage should be a key policy priority. Decent work entails concern with the quality of employment rather than just the quantity of jobs created: work that is productive, with fair incomes, good working conditions, access to social protection, and workers' voice and agency in the workplace (Barrientos et al., 2011). These issues are intrinsically important to realising the developmental potential of cannabis to address poverty, inequality and unemployment. There are also important instrumental reasons for the industry to pursue them. There is no recognition of these issues in the NCMP in its current iteration. Maintaining high ethical and sustainability standards industry-wide generates potential collective action problems, for example with the undercutting of rivals that maintain higher standards. This requires collective solutions rather than reliance on voluntary initiatives from individual firms. One potential measure is a multi-stakeholder decent work and sustainability charter or certification scheme to provide incentives and assurances around standards, with organised labour playing a role in development and governance of the scheme. Longer-term considerations could include decent work and sustainability conditions in licensing requirements. Organised labour representing workers in the industry should be involved in governance arrangements for the sector. Finally, support for sustainable cannabis production technology and business models should be a key component of R&D activity in the SSI.

6. Creating an inclusive cannabis economy

Inclusive growth entails not just improved outcomes for employment and equity, but widening participation and agency in the economy (Hickey et al., 2015; Klasen, 2010). Creating opportunities for traditional growers and small enterprises is central to realising this in the South African cannabis industry.

Formalisation of cannabis presents threats to livelihoods as well as opportunities

Even in a more accommodating legal and regulatory framework, traditional growers will face severe competitive disadvantages. Medical cannabis production is technology intensive, and requires access to patient capital. More mature hemp markets internationally exhibit multiple challenges for hemp farmers in attaining profitability. Experiences elsewhere in the South African agricultural economy attest to the serious difficulties integrating small-scale producers with poor infrastructure access into formal supply chains (NAMC, 2022). Meanwhile, adult-use legalisation could potentially threaten traditional grower livelihoods by exposing them to increased competition. Landrace cannabis varieties used by traditional growers are key indigenous knowledge assets that may have significant commercial value, but they are threatened by bio-piracy and contamination. In a worst case scenario in the absence of mitigating actions, cannabis legalisation may further marginalise traditional growers. There is too little recognition in the NCMP about the scale and urgency of these challenges.

The future regulatory system for legal adult-use cannabis has not been determined, but should be designed with inclusion as a key objective

The importance of adult-use markets to an inclusive cannabis economy

The most significant inclusive growth opportunities appear to lie in legal adult-use markets. This derives from greater market segmentation, the ability to produce a finished consumer product in the form of dry flowers (rather than an intermediate manufacturing input), and the likelihood that regulatory standards and the accompanying investment requirements would be less onerous than for medical cannabis. There are potential niche or low-complexity products in which traditional growers and small enterprises could develop footholds or pursue product differentiation strategies.

Tiered licensing systems to enable participation

Medical and hemp licensing systems currently create high barriers to entry for traditional growers. Consideration should be given to more complex, tiered licensing systems with lower compliance levels for qualifying small enterprises and traditional growers. These may involve shifting the burden of regulatory compliance downstream through offtake agreements with a GMP-licensed facility responsible for quality control, marketing and supervision. The future regulatory system for legal adult-use cannabis has not been determined, but should be designed with inclusion as a key objective: this is absent from the draft CPPB Section 1A. Tiered licensing systems would again be an important consideration, or social equity licensing arrangements similar to those used in many parts of the United States.

Support for building competitiveness

Reforms to the legal and regulatory system are necessary but not sufficient. Effective participation will require support measures to build producer capabilities and minimise competitive disadvantages through extension support, and investment in infrastructure and training. Alongside state agencies, a well-resourced industry association may be particularly useful in providing mentorship, information, and networking for new entrants.

Developing opportunities for specialisation

Supporting specialisation in niche product areas may be a useful means to support more resilient livelihoods. For example, using provenance-based marketing based on the uniqueness of the landrace strains and the terroir, or Fair Trade-style business models (Clarke and Riboulet-Zemouni, 2021; Kay et al., 2020). Ethical certification schemes potentially give producers additional pricing power and access to niche consumer markets. Research into the viability of such models should be a key research priority. Landrace cannabis varieties require protection against the threat of expropriation and contamination. This could include supporting benefit-sharing research into the medical properties of landrace varieties, obtaining intellectual property protections under indigenous knowledge systems protection laws and registration of Geographical Indications (GIs) for landrace varieties and associated place names. Benefit sharing models to ensure just distributions of economic gains derived from landrace varieties may draw lessons from the Rooibos industry. Finally, zoning regulations are required to minimise the risks of cross-contamination.

Support demand for traditional grower produce

Initiatives to increase the volume and quality of supply from traditional growers should be complemented by initiatives to support demand. This could involve measures to incentivise procurement from small producers, for example as part of an industry charter for inclusive and sustainable development or as a future licensing conditionality. In future legal adult-use cannabis markets, licensed dispensaries could be incentivised or required to stock produce from traditional growers.

ACRONYMS AND ABBREVIATIONS

API	Active Pharmaceutical Ingredient
ARC	Agricultural Research Council
CAGR	Compound annual growth rate
CBD	Cannabidiol
CPPB	Cannabis for Private Purposes Bill
CSIR	Council for Scientific and Industrial Research
DALRRD	Department of Agriculture, Land Reform and Rural Development
EMA	European Medicines Agency
EU	European Union
FAO	Food and Agriculture Organization
FDI	Foreign direct investment
GACP	Good agricultural and collection practice
GAP	Good agricultural practice
GI	Geographical indications
GMP	Good manufacturing practice
GVC	Global value chain
INCB	International Narcotics Control Board INCB
MRAs	Mutual recognition agreements
NCA	National competent authorities
NCMP	National Cannabis Masterplan
PICS	Pharmaceutical Inspection Co-operation Scheme
R&D	Research and development
SAHPRA	South African Health Products Regulatory Authority
SETA	Sector Education and Training Authority
SIZA	Sustainability Initiative of South Africa
SSI	Sectoral system of innovation
SPS	Sanitary and phytosanitary
THC	Tetrahydrocannabinol
UNODC	UN Office on Drugs and Crime

FIGURES AND TABLES

INTRODUCTION

Cannabis is among the world's most commonly used drugs, consumed at least once by an estimated 4% of the world's population in 2019 (UNODC, 2021). It has been used as a food, industrial material, and medicine for millennia (Nutt, 2022). However, for most of the past century, in most parts of the world, it has been prohibited. This is now changing, as an increasing number of governments adopt legalisation or decriminalisation policies. This is driven by a growing view that prohibition causes more harm than good: failing to prevent the illegal cannabis trade, while creating negative social impacts including large revenues for organised criminals, criminalisation of users that pose little threat to society, and untreated health problems (Buxton, 2020; Nutt, 2020; Rolles and Slade, 2022). There has also been a change in scientific views on both the health risks of cannabis, and its medical utility. Following a World Health Organisation review, in December 2020 the United Nations Commission on Narcotic Drugs rescheduled cannabis, removing it from the Schedule IV list of the most dangerous drugs with no therapeutic value (United Nations, 2020). Cannabis are increasingly used to treat a range of medical conditions. Finally, industrial cannabis (hemp) has a range of potential industrial applications ranging from textiles, to composite materials, to oils used in foods and cosmetics. It may also serve as a means of carbon sequestration and a substitute for some environmentally harmful materials like oil-based plastics.

The legalisation of cannabis may create important economic opportunities. Global demand for legal cannabis is forecast to grow significantly. Global markets for high-THC cannabis were estimated to be worth US$415 billion in 2020, with only 6% of this value being legally traded, almost all within Canada and the United States (New Frontier Data, 2021). Nonetheless, legal market demand is projected to grow at a compound annual growth rate (CAGR) of 16.6% between 2020-2025, increasing legal market value from US$23.7 billion to US$51 billion (ibid.). With the illegal market forecast to grow at a slower 2.6% CAGR between 2020-25,

Dried cannabis buds rolled into a joint for smoking.
(Photo: Oleksii Donenko / Alamy Stock Photo)

legal sales will likely be an ever-larger share of global cannabis market value, reaching 11% by 2025 (ibid.). This growth provides an opportunity to create jobs in cannabis cultivation, the processing and manufacturing of complex value-added industrial products, and the supply of specialised inputs and equipment in the value chain. It also provides an opportunity for governments to generate tax revenue. Many countries with favourable agro-ecological conditions hope to become low-cost suppliers to the large cannabis markets of the Global North. Among them are countries that have been major sources of supply to illegal cannabis markets. For such countries, cannabis legalisation offers additional developmental opportunities to improve the livelihoods of marginalised groups that have historically grown cannabis for illegal markets (Buxton, 2020).

South Africa is a significant emerging supplier in the global cannabis economy, and has a large illegal domestic cannabis market. In recent years there have been radical changes in the legal status of cannabis. Private adult-use[4] cannabis has been decriminalised following a Constitutional Court ruling in 2018. Medical and industrial cannabis is being legally cultivated by a growing number of licensed producers. The draft Cannabis for Private Purposes Bill (CPPB) currently going through Parliament maintains prohibition of commercial adult-use cannabis, but commits government to enacting future legislation to legalise it. A multi-stakeholder National Cannabis Masterplan (NCMP) process seeks to coordinate the private sector, government and labour to support the growth of the industry (DALRRD, 2021). The South African government is seeking to capitalise on cannabis as a development opportunity, with President Cyril Ramaphosa highlighting in his 2022 State of the Nation Address the potential to create 130,000 jobs (Roelf, 2022). The formal cannabis industry is widely perceived to provide particular benefits for 'traditional growers' cultivating cannabis for illegal markets in marginalised rural areas.

This report seeks to identify the main challenges to achieving inclusive development in the South African cannabis industry, and make suggestions

BASIC DEFINITIONS

Cannabis

Plants in the cannabis genus, including a range of species. Major species include Cannabis Sativa, Cannabis Indica and Cannabis Ruderalis. Different strains have been bred for different qualities. For example, some species have been bred to contain larger concentrations or particular 'cannabinoids' (see below), while others have been bred for their fibre content for industrial usages (see 'hemp' below).

Cannabinoids

Chemical compounds found in the cannabis plant which affect the human body, of which there are over 100. Two particularly important cannabinoids are tetrahydrocannabinol (THC) and cannabidiol (CBD). Cannabinoids can be extracted from the cannabis plant through various forms of post-harvest processing.

THC

The main psychoactive cannabinoid which produces the 'high' in adult-use (or, 'recreational') cannabis, and which has a range of medical applications. Cannabis produced for adult-use and medical applications often has a high THC concentration. THC has also been a central focus of prohibition.

CBD

An important non-psychoactive cannabinoid, with a range of health and wellness applications.

Hemp

A commonly used term for cannabis varieties used for industrial applications. These varieties are bred for low-THC concentrations, longer or stronger fibrous stems, or higher oil concentrations. Hemp typically contains higher concentrations of CBD.

(Clarke and Riboulet-Zemouni, 2021; de Lange, 2021; Prohibition Partners, 2021; SAHPRA, 2020)

4. Meaning for personal consumption in small quantities, rather than commercial activity.

for how these might be addressed by policymakers and industry stakeholders. Inclusive development entails processes of growth leading to more equitable distributional outcomes (Hickey et al., 2015). Broader conceptualisations of inclusive development involve also widening participation in the economy, and increasing agency and empowerment among marginalised groups – that is, addressing forms of exclusion (Hickey et al., 2015; Johnson and Andersen, 2012). Achieving significant, long-term growth and job creation in the South African cannabis industry will require fostering the industrial capabilities required to attain international competitiveness and enable the upgrading of products and production processes. Making this growth inclusive will require the creation of decent work. That is, work that is productive and with fair incomes, good working conditions, access to social protection, and workers' voice and agency in the workplace (Barrientos et al., 2011). In South Africa's conditions of high racialised inequality, it will also entail creating opportunities for small enterprises and traditional growers to meaningfully participate in the formal cannabis economy. Finally, it will additionally mean sustainable growth that does not exacerbate environmental stresses or contribute to ecological degradation.

The report draws on a combination of desk research and interviews carried out in 2021–22. The cannabis industry is at an embryonic stage and so there is limited existing research or official statistical data to draw on. To address knowledge gaps, 25 interviews were conducted with a range of cannabis stakeholders, including advocacy organisations, producers – invites were sent to all SAHPRA-licensed cannabis cultivators with publicly-available contact details – distributors, consultancies, and other assorted experts. These are listed in Appendix 1. Some interviews are cited with permission of interviewees, but otherwise anonymised due to either commercial confidentiality or the sensitive nature of the material discussed. The report is exploratory research, and findings and recommendations are provisional and tentative. The report does not seek to comprehensively cover all issues concerning the growth of legal cannabis markets. There are a range of important policy issues not addressed here, including fiscal policy, public health, and criminal justice. The economic development imperatives addressed in this report may in some instances be in tension with imperatives in these other policy areas, and careful consideration must be given to balancing them.

The structure of the report is as follows: The first section analyses international cannabis market trends across adult-use, industrial and medical cannabis and the challenges and opportunities they pose for inclusive growth in emerging cannabis supplier nations. The second section analyses the domestic market context, reviewing the legal and regulatory framework in South Africa across adult-use, industrial and medical cannabis, and its consequences for the cannabis industry. The third section focuses on challenges relating to industrial-scale cannabis production, while the fourth section focuses on challenges for traditional growers and small enterprises.

Industrial cannabis plantation farm green house.
(Photo: Sergio Azenha / Alamy Stock Photo)

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THE INTERNATIONAL CANNABIS ECONOMY: KEY TRENDS, OPPORTUNITIES AND CHALLENGES

Key points

- Reforms by governments worldwide have radically changed the legal status of cannabis. There is a growing global market for cannabis products.
- Cannabis legalisation offers potential developmental opportunities for emerging supplier nations. However, there are multiple challenges to realising these opportunities that should not be underestimated.
- The nature of the challenges and opportunities differ significantly between adult-use, medical and industrial cannabis (hemp).
- Adult-use cannabis accounts for most of the global cannabis industry value. Legalisation offers significant economic opportunities. However, opportunities are currently limited to domestic markets since international conventions prevent exports. Importantly, adult-use cannabis appears to offer the best opportunities for participation by small enterprises. Economic development imperatives need to be carefully balanced with public health imperatives.
- Medical cannabis currently offers the most significant export opportunities. As a high-value, technology-intensive form of precision agriculture with strong backward and forward linkages, it has significant industrial development potential. However, there are high financial and technological barriers to entry and complex regulations governing export market access.
- Hemp has a vast range of applications across multiple industrial and consumer goods. It has potential as a green substitute for oil-based plastics, some conventional cement-based building materials and cotton, which if realised would radically increase demand for hemp. Given less complex, outdoor cultivation systems, it seems to be more accessible to participation by small producers. However, export opportunities appear limited. Establishing a domestic market would likely require significant investment in processing capacity and demand creation.

Introduction

This section provides background on international cannabis markets, outlining key trends, challenges, and opportunities for inclusive development in emerging cannabis supplier nations. The legal cannabis industry is complex, and encompasses a wide range of different products. It is helpful to distinguish between three broad industry segments: medical cannabis, adult-use cannabis (sometimes referred to as 'recreational'), and industrial cannabis (hemp). These markets have different supply and demand dynamics, different regulatory systems, different value chain structures, and different opportunities and challenges for producers. Each category also typically relates to different cultivation and processing models, and to different strains of the cannabis

According to the UN Office on Drugs and Crime (UNODC), cannabis is the third most commonly consumed drug in the world, behind alcohol and tobacco

plant with different physical properties and/or concentrations of cannabinoids (see Box 1 above). There are further sub-categories within these three broad categories, and in some instances overlaps between them.

1.1 Adult-use cannabis

According to the UN Office on Drugs and Crime (UNODC), cannabis is the third most commonly consumed drug in the world, behind alcohol and tobacco, and was used by 4% of the global population at least once in 2019 (UNODC, 2021). Adult-use cannabis varieties typically have higher THC concentrations[5] to produce a psychoactive effect (a high). It is consumed in multiple ways, including smoking dried flowers (buds), inhalation of concentrates (dabbing), and edibles. Adult-use accounts for over 90% of the estimated US$415 billion global cannabis market (legal and illegal combined) (New Frontier Data, 2021). The number of past-year users increased 23% in the decade 2010-2020 (UNODC, 2022). A growing number of countries have decriminalised or legalised adult-use cannabis.

Challenges in the regulation of adult-use cannabis

Adult-use cannabis regulation can be understood as a spectrum – rather than a legal/illegal binary – containing four broad categories: prohibition, decriminalisation, state-controlled markets and free markets (Rogeberg et al., 2018) (Figure 1).

FIGURE 1

A spectrum of regulatory systems for adult-use cannabis

Source: adapted from (Rogeberg et al., 2018)

5. Research shows wide variations in THC levels, with low-THC varieties containing 5% - 10% THC, and more recently developed high-THC varieties with THC concentrations of 25% - 30% (Cash et al., 2020; Manthey et al., 2021). THC levels below 1% do not produce a significant psychoactive effect.

Adult-use cannabis regulation involves difficult trade-offs (Rolles and Slade, 2022). Commercial growth imperatives must be carefully managed to avoid problems historically associated with the tobacco and alcohol industries.

Decriminalisation commonly involves legalisation of, or tolerance for, a combination of cultivation, use, and possession of small amounts of cannabis for personal consumption, without permitting commercial production or sales. Around 30 countries have decriminalised cannabis, including South Africa (Section 2.1). Decriminalisation may reduce some social harms arising from criminalisation of users, but a key disadvantage is that cannabis supply typically remains informal and at least partly controlled by organised criminals, given that many users will not produce their own cannabis. A means of addressing this while prohibiting commercial trade is the 'grow club' or 'social club' model, employed in Spain, whereby users obtain cannabis from private non-profit organisations growing cannabis on behalf of members in accordance with regulatory standards (Pardal et al., 2022). Fewer jurisdictions have legalised commercial sales of adult-use cannabis. These include Canada, Uruguay, multiple states in the United States, the Netherlands, and most recently Thailand.[6] Several other countries are taking steps towards adult-use legalisation, including Switzerland and Germany (Stevens, 2022; Westendarp, 2022). Analysts anticipate continued momentum towards adult-use legalisation, with a common legislative trajectory from medical to adult-use legalisation as increased familiarity and normalisation enables reform. Existing legal adult-use cannabis markets are regulated in differing ways. Regulation is necessary to minimise potential harms from cannabis consumption. Though considerably less harmful than alcohol (Pasche and Myers, 2012; van Amsterdam et al., 2015), cannabis is not a 'harmless' drug: harms include impaired decision making while intoxicated (for example while driving), addiction or dependence, associative links with mental illnesses such as psychosis in heavy users or those with underlying conditions, effects on foetal development among pregnant users, and in particular potential adverse impacts on adolescent heavy-users (Nutt, 2022; UNODC, 2022). Most problems relate to a small minority of users consuming high quantities. High-THC cannabis varieties also increase risks (Nutt, 2022). The existence of such harms is not necessarily an argument against legalisation or decriminalisation. Leaving aside issues of individual freedom, prohibition has failed to meaningfully limit either supply or demand for cannabis. Society's ability to minimise the drug's harms by managing what types of cannabis are consumed, by whom, in what quantities, and under what conditions, are severely diminished in illegal markets. Users typically have no way of knowing the THC content of their cannabis, and no protection from dangerous chemicals and contaminants used by unscrupulous growers. Users suffering addiction may be discouraged from seeking treatment for fear of prosecution or stigmatisation. Vulnerable users, such as adolescents, may lack reliable information on the drug. There are also wider social harms to consider: large income streams to organised criminals, the diversion of police resources, and the criminal prosecution of many users – typically from low-income groups and disproportionately impacting black people – who are causing little or no harm to wider society. The case for legal, regulated cannabis markets derives from harm-reduction imperatives (Nutt, 2020).

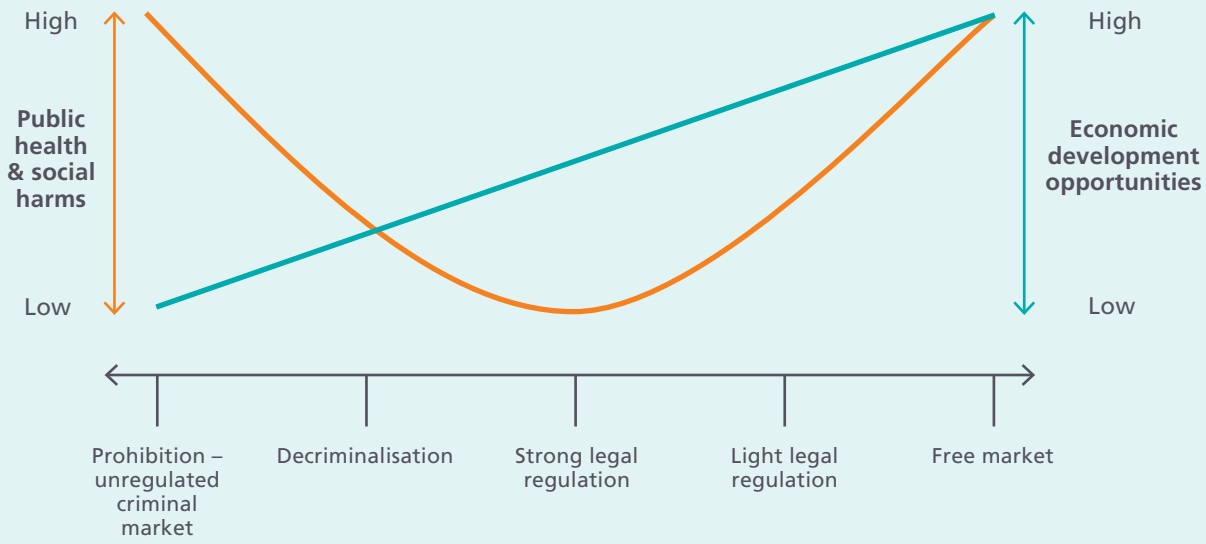
Adult-use cannabis regulation involves difficult trade-offs (Rolles and Slade, 2022). Commercial growth imperatives must be carefully managed to avoid problems historically associated with the tobacco and alcohol industries where marketing and advertising was frequently allowed to run amok, encouraging and enabling irresponsible consumption. However, strict regulatory controls on supply and availability may have other negative consequences. In particular, the more difficult or costly it is for users to legally access cannabis, the more likely the illegal market persists, or even remains dominant. This tension is reflected in existing legal cannabis markets. Additionally, onerous regulation may not only limit commercial opportunities (and

6. Cannabis is legal in 19 States of the US at the time of writing, but is illegal at the Federal level. In the Netherlands, sale of cannabis is still a criminal offence, but sales of small amounts within 'coffee shops' abiding by specific criteria are tolerated.

the formal employment and tax revenue generated by them), but also limit inclusiveness if small firms struggle to meet regulatory requirements. This may prevent participation by marginalised groups, and discourage illegal producers from formalising. This has been a particular concern in the United States. These trade-offs are visualised in Figure 2 below:

FIGURE 2

Trade-offs in cannabis regulation



Adapted from: Transform Drug Policy Foundation (2022)

Contextual differences mean it is wrong to assume that regulatory approaches that work in one place will automatically do so in another. It is still useful to briefly consider experiences of early legalisers, which have taken different approaches to these trade-offs. The Uruguayan government exerts tight control over the cannabis market. Cannabis can only be bought from licensed dispensaries, by over 18s registered with the government, up to a maximum of 10 grams per week. The state also controls what cannabis varieties can be sold, with a maximum 9% THC level (Maas, 2022). In Canada and the United States, regulations differ by Province/State. Sales are typically through licensed private dispensaries or state-owned vendors (in Canada), with public consumption forbidden or restricted to authorised venues in some cases (Government of Canada, n.d.). The Cannabis Act in Canada contains a range of measures to control demand, including restrictions on advertising and branding, alongside controls on packaging and labelling, and requirements for prominent health warnings and statements of THC content.[7] The full impacts of legalisation will take decades to understand, and much of the evidence is inconclusive or subject to differing interpretations (UNODC, 2022). Some research on the Uruguayan and Canadian examples suggests legalisation has not significantly increased risky forms of consumption (Haines-Saah and Fischer, 2021; Laqueur et al., 2020; Owusu-Bempah, 2022; Rivera-Aguirre et al., 2022). Statistics Canada's Cannabis Consumption Survey shows use rates to have stabilised at relatively similar levels to pre-legalisation (Public Health Agency of Canada, n.d.). The German government's cannabis legalisation proposals suggest a similar approach to Uruguay, with cannabis available for sale from licensed vendors, advertising bans, 20 gram restrictions on purchasable quantities, 10% THC limits for

7. For example, it is prohibited to sell cannabis if "there are reasonable grounds to believe that a package or label could be appealing to young persons", or if packaging/labelling "associates it or any one of its brand elements with, or evokes a positive or negative emotion about or image of, a way of life such as one that includes glamour, recreation, excitement, vitality, risk or daring". Packaging must be in uniform, dull colours, with standardised health warnings, and no brand elements or images.

A notable feature of North American markets is expansion of 'craft' or 'artisanal' cannabis producers, often operating at small-scale, targeting product niches, using diverse production models including less capital-intensive outdoor growing systems, and organic or sustainable methods

18-21 year-olds, and 15% limits for over-21s (Cantrill, 2022). In the United States, many legalising States have followed an approach closer to the free market end of the spectrum, permitting more marketing and fewer constraints on access. Though there are restrictions on advertising and branding targeted at under-21s, researchers have raised compliance concerns (Carlini et al., 2020; Moreno et al., 2022; Whitehill et al., 2020). Evidence from early-legalising states in the United States seems to show more significant increases in consumption and risky behaviours (UNODC, 2020).

Legal adult-use cannabis as an economic opportunity

While there should be caution in assuming replicability across contexts, North American adult-use market trends are important to consider. They suggest particularly important opportunities for inclusive economic development relative to other forms of cannabis production. Adult-use cannabis is now a major consumer goods industry in the United States and Canada, which accounts for 97% of legal adult-use sales value worldwide (New Frontier Data, 2021). In Canada, between 2018 and 2021, the value of adult-use cannabis sales was just under CAS$7.5 billion (~R95 billion), with the cannabis industry contributing capital expenditure of CA$29 billion (~R375 billion), sustaining 151,000 jobs and paying CA$15 billion in tax (~R195 billion) (Deloitte, 2021). However, it is important to note there are no legal export market opportunities in adult-use cannabis at present due to UN drug control conventions that prevent international trade in cannabis except for medical and scientific purposes (discussed in Section 2.4). North American adult-use cannabis markets are complex and segmented, with a range of niche products. There has been considerable product innovation, with cannabis genetics being a major focal point. New and unique cannabis varieties are used as the basis for much branding and marketing, and genetics R&D is a notable feature of many major listed cannabis producers (Owens, 2019; Vanstone, 2020). Though much initial focus has been on THC content, the market is increasingly sophisticated, with quality associated with a wider range of sensory characteristics (Plumb et al., 2022). Varieties are also bred for combinations of flavonoids and terpenes, which affect taste and aroma. There is also a growing market for varieties with lower THC and higher CBD content, producing a more relaxing effect. Multiple experts interviewed saw novel genetics as the major basis for product differentiation and generation of rents in the cannabis value chain over the long term. Though dry flowers are still the dominant product, legal markets exhibit rapid growth in an expanding range of complex, value-added manufactured products, such as vapes, topicals, concentrates and edibles (Soloveichik, 2021). This highlights significant industrial development opportunities in adult-use cannabis.

Liberalisation has catalysed the growth of corporate capital in the North American cannabis industry, with large agribusiness and biotech firms involved in various stages of the cannabis value chain. Just over US$10 billion in equity and debt capital was raised by cannabis firms in US and Canadian capital markets in 2021, in comparison to less than US$500 million elsewhere in the world (Prohibition Partners, 2021, p21 & 55). These firms play a major role in cannabis innovation, including development of new genetic material, branding, and advanced cultivation and processing equipment. Cannabis is also drawing investment from corporate actors in adjacent industries like pharmaceuticals, tobacco and alcohol (Bewley-Taylor et al., 2020). However, another notable feature of North American markets is expansion of 'craft' or 'artisanal' cannabis producers, often operating at small-scale, targeting product niches, using diverse production models including less capital-intensive outdoor growing systems, and organic or sustainable methods. Indeed, data collected by Cannabis Business Times suggests considerable growth in outdoor cultivation between 2016-2020, with 12% of survey respondents using fully-outdoor cultivation systems, and a further 16% using mixed greenhouse/outdoor systems (Simakis, 2020).

A global value chain is emerging. This presents potential opportunities for emerging supplier nations.

Craft producers are a significant feature of the market and have been eating into larger producers' market share (Prohibition Partners, 2022). This highlights a crucial point that market segmentation and niche product differentiation opportunities in adult-use cannabis may create spaces for small enterprises that, as discussed below, appear harder to establish in industrial or medical cannabis.

Nonetheless, small-scale producers face multiple challenges, and there are concerns about consolidation and 'corporate capture' (Rolles and Slade, 2022; Schroyer, 2022). While there has been significant growth in the North American cannabis industry, this has involved a dramatic boom-bust cycle with an initial investment rush creating excess capacity and price declines. This has eroded profitability, with many business failures and falling stock prices among large firms (Mitchell, 2021; Prohibition Partners, 2022). Alongside over-investment and increased competition, a contributing factor is the persistence of illegal cannabis supply. The reasons for this include lower costs and greater convenience for consumers, and regulatory compliance costs for producers (Bodwitch et al., 2021; Goodman et al., 2022; Kavousi et al., 2022; Robertson and Thyne, 2021). The legal market is nonetheless overtaking illegal sales as price differentials narrow and dispensary networks expand. In Canada it took just two years for legal sales to surpass illegal sales, but illicit markets remain significant (Lamers, 2021; Prohibition Partners, 2022). Efforts to regulate for an inclusive cannabis economy should consider measures to support small producers and ensure barriers to entry are not so high as to prevent their participation (Section 4).

1.2 Medical cannabis

The global medical cannabis industry is small compared to adult-use, but is growing rapidly with multiple governments legalising its use in recent years. Since it can be legally traded internationally, a global value chain is emerging. This presents potential opportunities for emerging supplier nations.

Trends in medical cannabis markets

Though cannabis has been used medically for millennia (Nutt, 2020), scientific research remains in relative infancy due to prohibition. There is, however, a growing body of research on the effectiveness of cannabis in treating conditions including epilepsy, multiple sclerosis, and Parkinson's disease. Pain-related conditions, estimated to affect a fifth of the world's population at some point, are viewed as the most significant medical application (New Frontier Data, 2021). Though there is still considerable debate around the efficacy and safety of different medical cannabis treatments, shifts in scientific opinion have been sufficient to prompt reforms by many governments. As of 2020, medical cannabis was legally available to some degree in 48 countries (New Frontier Data, 2021). There were an estimated 4.4 million 'active medical cannabis patients' accessing high-THC products worldwide in 2020, 84% of them being in the United States (New Frontier Data, 2021).

Medical cannabis is a broad category, comprising:

- **Pharmaceutical cannabis products** containing refined cannabinoid isolates, and typically having undergone clinical trials to become regulated medicines treating specific conditions, such as epilepsy and multiple sclerosis.
- The **prescription of medical cannabis** for therapeutic purposes, often as dry flowers for smoking, with varieties chosen for particular levels/combinations of cannabinoids. There is also a growing range of manufactured medical cannabis products, typically involving concentrates/extracts in oil form. Depending on the jurisdiction, it is used to treat a wide range of conditions, including chronic pain and nausea from chemotherapy.
- The general sale of unlicensed **wellness/complementary medicine cannabis products**, typically with small amounts of CBD. Users take these for a range of purposes, such as stress relief or improving sleep.

(Komand Consulting, 2020; Prohibition Partners, 2019)

Growth in medical cannabis presents potential opportunities for cannabis exporters. A global value chain is emerging, with trade not only in finished products but a range of complex intermediate goods.

In terms of value added and technological complexity, these applications can broadly be considered as a hierarchy, with isolates and pharmaceutical products at the top, oil extracts in the middle, and raw cannabis flowers at the bottom. Extracts differ widely, from basic 'raw oils', to refined oils where fats, lipids and waxes are removed, to heavily refined distillate oils, to ultra-pure cannabinoid isolates (Komand Consulting, 2020). Komand Consulting estimates that per milligram of THC, isolates and extracts fetch 7-9 times the price of cannabis flowers (ibid.). For the period June 2020 in the United States, bulk cannabis flowers for CBD were US$318 per kilogram, whereas refined CBD oil was US$1,549 per kilogram, and CBD isolate US$1,964 per kilogram (Hempbenchmarks.com in UNCTAD, 2022).

The pharmaceutical cannabis market is only just emerging, with only a handful of cannabis drugs having undergone clinical trials and obtained regulatory approval. For example, Epidyolex, a CBD-based drug used to treat severe epilepsy, in 2018 became the first drug containing purified substances from cannabis approved by the US Food and Drug Administration. Other cannabis-based drugs have been approved in other jurisdictions. The number is anticipated to grow with research on cannabis increasing in the pharmaceutical industry. 'Big pharma' is increasingly investing in cannabis research (Halley, 2020; Sabaghi, 2022). Non-pharmaceutical medical cannabis is more established, and rapid growth is forecast with active medical cannabis patients anticipated to grow from 4.4 million to 6.5 million between 2020-2025 (New Frontier Data, 2021). Medical cannabis products vary by market, but dry flowers typically constitute a large share of total consumption, for example 38% in Canada, 40% in Germany, 50% in the Netherlands (Prohibition Partners, 2021). This is expected to decrease as demand grows for processed products such as capsules and vaping oils, which enable more precise dosage control (ibid.).[8] There is also rapid growth in a range of CBD-based 'wellness' products on general sale. These markets are well developed in Canada and the United States, but are growing rapidly in Europe following the European Court of Justice's 2020 ruling that CBD should not be considered a narcotic under the 1961 UN Convention on narcotics, given a lack of psychoactive or harmful effects (Prohibition Partners, 2021). Europe is now estimated to be the world's largest CBD market, with over 30% CAGR forecast between 2021-2027 (Graphical Research, 2021; Prohibition Partners, 2021).

Medical cannabis as an economic opportunity

Growth in medical cannabis presents potential opportunities for cannabis exporters. A global value chain (GVC) is emerging, with trade not only in finished products but a range of complex intermediate goods. This includes dry flowers for final consumption, bulk dry flowers for processing, and extracts. Medical cannabis production is a technology-intensive industry. Alongside value-addition downstream of cannabis cultivation, there is also global trade in genetic material (seeds, clones, and tissue cultures), inputs, and cultivation equipment (Section 3). The major players in this emerging GVC are large firms from North America and Europe, with Canadian firms particularly outwardly-oriented in seeking new markets to establish international production facilities (Prohibition Partners, 2021b). While established cannabis producers from northern high-income economies have a head-start, countries with lower factor costs and sunnier, warmer climates (meaning less reliance on artificial heat and light) may be price competitive in the long-term (Bewley-Taylor et al., 2020; Prohibition Partners, 2021; Prohibition Partners, 2019; New Frontier Data, 2021). South Africa is a frequently

8. Interview 22.

Medical cannabis exports appear an attractive industrial development opportunity. Medical cannabis is a high-value product, with dry flowers selling at wholesale for €2-4 per gram (having fallen considerably in recent years)

cited example. The extent to which such climatic advantages translate into international competitive advantages is still a matter of debate. Medical cannabis production is commonly carried out either indoors or in advanced, controlled-environment greenhouses. This is a regulatory requirement to control contamination and diversion risks. Additionally, maintaining high levels of consistency required for a medical product necessitates precise control of production variables (Section 3). Some growers and experts consider it too difficult to achieve this with variable light and temperatures in greenhouses or outdoor systems, and consequently – alongside yield advantages discussed below – favour fully indoor grows using artificial light.[9] Others raise concerns about the environmental sustainability of indoor cultivation given the energy requirements (Kay, 2022; Mills, 2021).

Medical cannabis exports appear an attractive industrial development opportunity. Medical cannabis is a high-value product, with dry flowers selling at wholesale for €2-4 per gram (having fallen considerably in recent years).[10] Yields vary according to the production system, but Deloitte estimates greenhouse growers typically achieve yields of 180 grams per square metre, and indoor growers 300 grams (Deloitte, 2016). Given the short growth-cycle, cultivators can produce multiple harvests per year – up to five from the same growing room indoors (Owens, 2019). This means a small area under greenhouse production, for example half a hectare, can potentially produce revenues in the tens of millions of Rand per year, far exceeding typical forms of high value horticulture. Small production facilities can employ in the region of 30-40 people,[11] including a range of semi- and highly-skilled jobs (Gobbi (ed), 2022). For the production of medical export dry flowers, advanced precision agriculture equipment is required to control key production variables (light, temperature, humidity, carbon dioxide, nutrients, water) while managing pests and contaminants. Producing dry flowers involves complex post-harvest processing, involving drying, curing, trimming, pruning and packaging. This also involves skilled jobs. Similar to other forms of high-value export horticulture (Cramer et al., 2022), medical cannabis has manufacturing-like qualities, with significant backward and forward linkages to complex industrial activities.

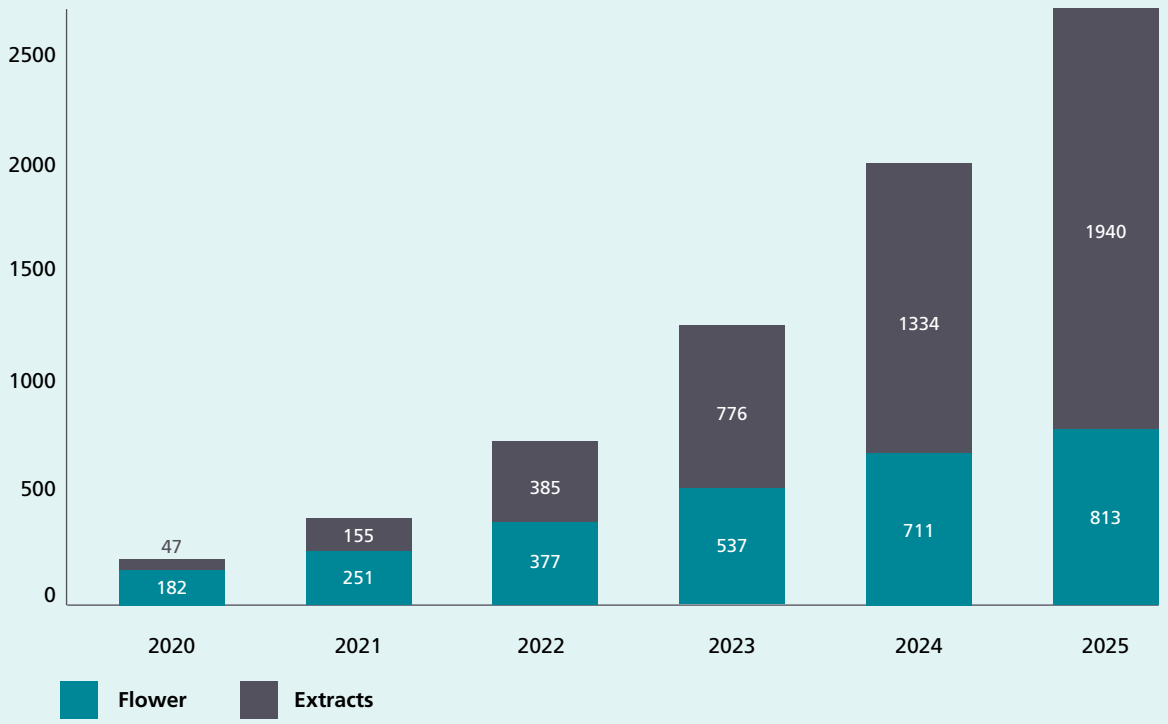
As with adult-use cannabis, North America accounts for most of the value of global medical cannabis markets. However, it is currently not possible to export medical cannabis to the United States due to its illegality at Federal level, nor to Canada due to protectionist measures.[12] European markets are instead becoming the centre of gravity for the emerging cannabis GVC. Multiple European governments have legalised medical cannabis. According to New Frontier Data, of US$10.2 billion legal medical sales of high-THC cannabis in 2020, Europe accounted for US$247.7 million, with just over 100,000 medical cannabis patients (New Frontier Data, 2021). Within the EU, the largest market is Germany (US$206 million) (ibid.). While small relative to North America, the European medical market is growing rapidly, with 19.7% CAGR forecast to 2025 (see also Figure 3) (New Frontier Data, 2021; Prohibition Partners, 2020). The next largest non-EU markets are (as of 2020) Israel (US$158.9 million), Australia (US$89.6 million), Jamaica (US$12.7 million), Uruguay (US$3.9 million), and Colombia (US$3.5 million) ibid.) A number of African and Latin American countries have also legalised medical cannabis. However, in the short-term these markets remain small, and Europe is the key export growth market. Demand is expected to grow to exceed domestic supply in many European countries, where there is limited domestic cultivation capacity and a high cost-base (New Frontier Data, 2021). Germany in particular is expected to have significant supply shortages to be met through imports (Richards, 2022).[13] That said, there is considerable uncertainty, with signs of potential over-supply and faltering growth over the past year (Section 3.4).

9. Interviews 11 and 17.
10. At the time at which interviews were conducted in mid 2022.
11. Interviews 11-17, see also (Gobbi (ed), 2022).
12. Besides Canada and the US, a number of other major markets also prevent commercial medical cannabis imports, including the Netherlands, Switzerland, and Thailand (Prohibition Partners, 2021, 43).
13. Interview 25.

There are high entry barriers due to the technological complexity of export medical cannabis production, which requires large investments in equipment and skilled staff.

FIGURE 3

European medical cannabis market demand forecast, € million (Prohibition Partners, 2022)



Challenges for emerging supplier nations in the medical cannabis GVC

While there are significant potential export opportunities for emerging supplier nations, realising such opportunities will not be easy. There are high entry barriers due to the technological complexity of export medical cannabis production, which requires large investments in equipment and skilled staff. As discussed below, common assumptions that growers currently producing at small scale for illegal markets will transition easily into medical cannabis value chains are misplaced. Secondly, even for those with requisite capital and capabilities, the complex, rapidly-evolving regulatory environment makes export market access challenging and uncertain – particularly for the European Union (Section 3). Finally, there is intensifying competition: many countries are seeking to become medical cannabis exporters. Eight countries in the Global South were exporting cannabis in 2021, with more expected to join in the coming years (Prohibition Partners. 2021). Key emerging supplier regions include:

- **Southern and East Africa:** most notably Lesotho, which began medical cannabis production in 2017 and has received considerable Foreign Direct Investment. Other countries in southern Africa undertaking reforms for medical cannabis exports include Zimbabwe, Zambia, and Malawi; in Eastern Africa, Rwanda and Uganda have ambitious investment plans.
- **Latin America and the Caribbean:** Jamaica, Peru, Paraguay, Colombia, and Uruguay. Colombia in particular is rapidly emerging as a major cannabis exporter.
- **The Mediterranean:** Israel has established itself as a key node in the emerging global cannabis industry with a large domestic market and biotech industry. Morocco is a major supplier of illegal markets, and is seeking to formalise its illegal cannabis industry and supply Europe.

Much of the renewed enthusiasm for hemp relates to expectations of its environmental benefits as a substitute for polluting materials.

Contestation of export markets is anticipated to become increasingly fierce, with risks of over-supply. Analysts highlight the risks of a speculative over-investment (Prohibition Partners, 2021; Bewley-Taylor et al., 2020) leading to a 'cannabinoid glut' (New Frontier Data, 2021). Wholesale cannabis prices have already fallen significantly in major markets due to oversupply, with interviewees reporting prices falling from around US$8 per gram to US$2.5 per gram (Demko, 2022; Mitchell, 2021; Nguyen and Blood, 2022).[14] Addressing these challenges will require building an effective sectoral system of innovation that supports product and process upgrading to maintain competitiveness and transitions into higher-value activities in the value chain (discussed in Section 3).

1.3 Industrial cannabis (hemp)

Historically, hemp was an important and widespread industrial fibre. However, cannabis prohibition policies also suppressed hemp production in many countries (Rupasinghe et al., 2020). Its recent rejuvenation stems from the broader shift away from prohibition. The division between hemp and cannabis used for adult-use/medical markets is somewhat artificial: hemp plants are also varieties of Cannabis Sativa, but bred for different purposes (Johnson, 2018; Rupasinghe et al., 2020). Hemp varieties are typically legally differentiated by a THC threshold, which varies by regulatory jurisdiction, commonly in the range of 0.2-1%.

Hemp is cultivated primarily for fibres, nutrient-rich seeds, and CBD from flowers. Some producers specialise in one of these products, while others produce dual-purpose crops. Hemp has a vast range of potential applications, with as many as 25,000 hemp-based products by some estimates (Rupasinghe et al., 2020). These include consumer goods and industrial products. Seeds and their oils are commonly used in food and animal feeds (hemp seeds are highly nutritious) and, cosmetics (MPI, 2018; NAMC, 2017; Adhikary, 2021). Fibrous stalks and hurds are processed into products including textiles, paper/card, composites, plastics, and building materials (NAMC, 2017; Mark et al., 2020). Much of the renewed enthusiasm for hemp relates to expectations of its environmental benefits as a substitute for polluting materials. For example, 'hempcrete' as a substitute for some cement-based building materials, hemp-based plastics as substitutes for oil-based plastics, and hemp textiles as a substitute for more water-intensive cotton (Lowitt, 2020a). Hemp requires relatively little water or herbicide, and sequesters large quantities of carbon (Rupasinghe et al., 2020; UNCTAD, 2022). Some researchers suggest hempcrete production can generate negative CO^2 emissions (Arehart et al., 2020), and that hemp cultivation can be more effective at sequestration than typical forest cover (CarbonCredits.com, 2022; UNCTAD, 2022). Finally, hemp plants are effective phyto-remediators (Placido and Lee, 2022), absorbing pollutants to clean contaminated land. Positive environmental externalities may enable hemp producers to generate additional income streams, for example generating carbon credits in offsetting schemes (Singular, 2022), and provide a potential rationale for state support.

Trends in hemp markets

Global hemp production has been increasing significantly over recent years. Just over 40 countries produce industrial hemp in significant quantities (UNCTAD, 2022). Hemp seed production and hectares planted have been increasing consistently since 2015, roughly doubling in this period (Figure 4). Figure 5 shows raw or retted hemp production – retting being the decomposition of hemp plants prior to fibre extraction. Again, there has been significant growth recently, but production remains low by historical standards. These volumes are also small compared to rival natural fibres and oilseeds: hemp accounts for only 0.5% of natural fibre production (Rupasinghe et al., 2020).

14. Interview 11.

FIGURE 4

Hemp seed production and hectares planted, 2000–2020 *(Source: FAOstat)*

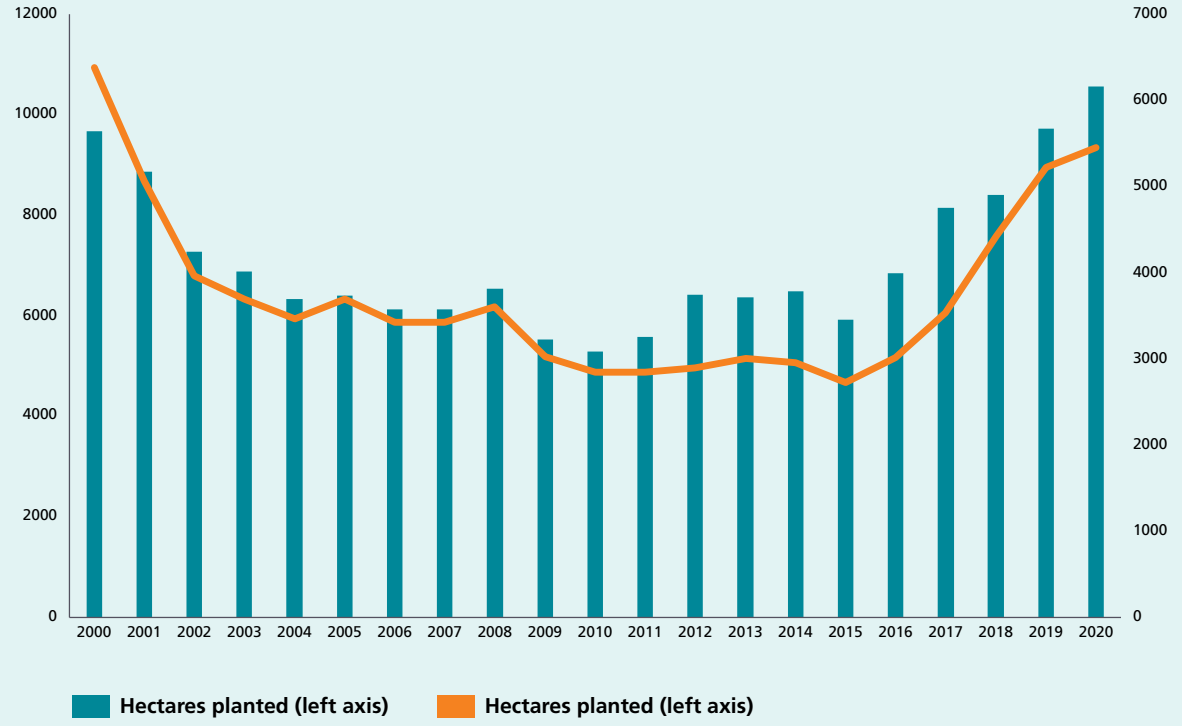
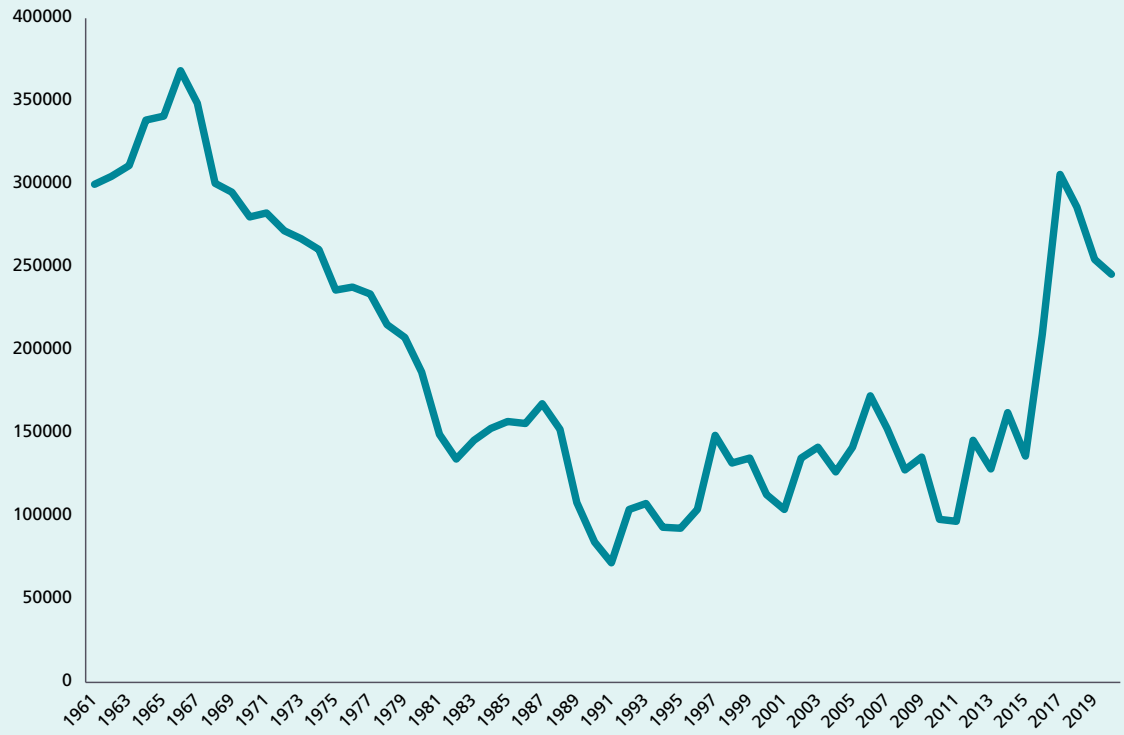


FIGURE 5

Hemp production, raw or retted, 1961–2020 (tonnes) *(Source: FAOSTAT)*



Hemp's wide range of applications means the potential market is large. Recent global market value estimates are around US$4 – 5 billion (Burger, 2022; Grand View Research, 2020; UNCTAD, 2022). Grand View Research (2020) forecasts 16.8% CAGR up to 2030. Research for the New Zealand government cites forecasts of a 13.7% CAGR in fibre hemp, and 22% in food hemp (Moore et al., 2021). Market size estimates for CBD are typically made separate to industrial hemp products. Grand View Research estimates global CBD market value as US$5.2 billion in 2021, with a CAGR of 16.8% forecast between 2022-2030, with around three quarters of this accounted for by pharmaceuticals and the remainder by wellness products (Grand View Research, 2022).

Future demand for hemp is, however, unpredictable given many major industrial applications are relatively novel or niche, and face significant competition from substitutes or regulatory uncertainty (Lowitt, 2020b). Textiles account for around a quarter of market value in 2021, food and beverages, personal care and animal products each account for around 15%, while paper, automotive industry applications (composites for car interiors), and construction materials are significant among the remainder (Grand View Research, 2020). The major markets are North America, Europe and China, and supply is also concentrated in these regions. According to data from the UN FAO, Canada and France account for around two thirds of hemp fibre production, and 80% of hemp seed production (UNCTAD, 2022).

Chinese hemp production has reportedly grown rapidly, and some estimate it to be the largest hemp market (MPI, 2018; Mark et al., 2020; Prohibition Partners, 2021). Over 40 countries exported hemp in 2020, with the top three being the Netherlands, Switzerland and the USA; all top-10 hemp import markets were either in North America or Europe (Trademap). Market segmentation differs significantly between major hemp markets. Hemp in the Chinese market, and Asian markets generally, is used mainly for industrial products and textiles (Moore et al., 2021). In North America, hemp markets are more oriented to consumer goods (foods, cosmetics) and CBD production. As with adult-use cannabis, North America has the most advanced markets for consumer hemp products (Moore et al., 2021; Mark et al, 2020). Production has grown rapidly in Canada since legalisation in 1998 and in the US since the 2018 Farm Bill, prior to which the US was import-dependent (Johnson, 2018). European hemp production is also growing rapidly, with 75% growth to 34,000 hectares under cultivation in the five years to 2019 (Mark et al., 2020). Demand for CBD has been a key driver (Mark et al., 2020), though the European market remains dominated by fibre and animal feed production (Lowitt, 2020b; Moore et al., 2021). France is the dominant European hemp producer, responsible for around 70% of supply (European Commission, n.d.).

Hemp as an economic development opportunity

As with medical cannabis, major established suppliers have a competitive head start in hemp, but there are numerous prospective emerging suppliers with favourable climatic conditions who are seeking to enter the market – South Africa among them. Most hemp production is outdoors, the exception being medical CBD production. Hemp cultivation appears to have attractive qualities for inclusive rural development. Firstly, it is a relatively labour-intensive crop. Trials in South Africa by House of Hemp (2018), created five jobs per hectare farmed, while the South African firm Labat's studies suggest three jobs per hectare (Labat, n.d.). Interviewees cited similar figures. This compares favourably to other types of agriculture (Table 1). Secondly, given outdoor production with lesser requirements for precision control, hemp production may be more accessible to smaller producers (Lowitt, 2020b, 2020a; UNCTAD, 2022). Hemp is potentially attractive for agrarian livelihoods in other respects. Dense, rapidly-growing foliage means weed control (and thus the cost of herbicide) is less of a challenge than for many crops. Hemp can be a multi-use crop, with seeds, fibres and flowers either sold into different markets or retained for animal feed and bedding (Lowitt, 2020b, 2020a).

TABLE 1

Agricultural workers per hectare

Outdoor hemp	3–5
Table grapes	2.2
Stone fruit	1.2
Tobacco	1.2
Vegetables	0.9
Citrus	0.5

Source: Key informant interviews, Operation Phakisa: Workstream Agricultural Labour document.

Challenges relating to hemp cultivation should not be underestimated, as experiences in more advanced hemp markets demonstrate. Hemp can be a dual (seed/fibre) or multi-use crop (seed/fibre/CBD), and there are potential benefits to multi-crop strategies for inclusive rural development at an early stage of the industry (UNCTAD, 2022). However, producers in advanced markets typically specialise (Johnson, 2018; Kaiser et al., 2015; Lowitt, 2020b). Plant varieties, cultivation techniques, and post-harvest processing methods differ widely according to the end market, and are highly specialised (UNCTAD, 2022). Product values also differ widely. Research by UNCTAD shows an average per kilogram value in 2020 of US$0.94 for semi-processed hemp, US$1.38 for raw hemp, and US$9.1 for hemp yarn, while a kilogram of hemp oil reached US$931 in European markets in 2021 (UNCTAD, 2022). Correspondingly, in general, fibre cultivation produces the lowest revenues per hectare, followed by seed, with the highest value from 'floral hemp' grown for CBD (Table 2).

North American hemp farmers have faced struggles maintaining profitability (Johnson, 2018; Michigan Department of Agriculture and Rural Development, 2020). There are also significant challenges with uncertainty and price volatility given the small size of the markets and niche characteristics of most end-products (UNCTAD, 2022). Production costs are high, with seeds in particular accounting for a large proportion of costs (Anum Laate, 2019; Michigan Department of Agriculture and Rural Development, 2020; Quinton, 2021). In terms of profits, a United States Department of Agriculture review states there are 'modest returns for grain, negative returns for fib[re], and large returns above variable costs for CBD' (Mark et al., 2020). Trials in Kentucky showed 'potentially modest returns per acre compared with conventional crops', with seed production more viable than

Worker in a plant processing hemp fibre for industrial use prepares bales of hemp straw for packing and despatch. (Photo: James King-Holmes / Alamy Stock Photo)

While a large and fast-growing global industry, in its raw or semi-processed form hemp does not appear to be traded internationally to a significant degree relative to the size of the industry.

fibre production (Fortenberry and Mick, 2014; Mark et al., 2020). Though more profitable, CBD production is technologically challenging, and there have been significant declines in CBD prices due to oversupply (Jelliffe et al., 2020; UNCTAD, 2022). In particular, accessing medical CBD markets would likely require controlled environment cultivation and operating under a tighter regulatory system for medical products (Lowitt, 2020b; UNCTAD, 2022). Though less complex, the low revenues from fibre production require economies of scale in 'broadacre' cultivation systems (Moore et al., 2021). Competition as markets mature can be expected to bring further specialisation, with higher yields required for breakeven (Jelliffe et al., 2020) necessitating greater investment. Industrial-scale production requires specialised equipment and skills (UNCTAD, 2022). Research in the United States suggests smaller producers struggle to afford equipment purchases (Michigan Department of Agriculture and Rural Development, 2020).

TABLE 2

Hemp cultivation statistics, United States 2021

	Value	Planted area	Value per acre	Yield	Price
	US$ million	Acres	US$/acre	Median, pounds/acre	Median, US$ per pound
Floral hemp	623	16,000	38,938	240	29
Grain hemp	6	8,225	729	340	2.4
Fibre	41.4	12,700	3,260	690	0.4
Seed	41.5	3,515	11,807	90	13.4

National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA) National Hemp Report 02/17/2022 (cornell.edu)

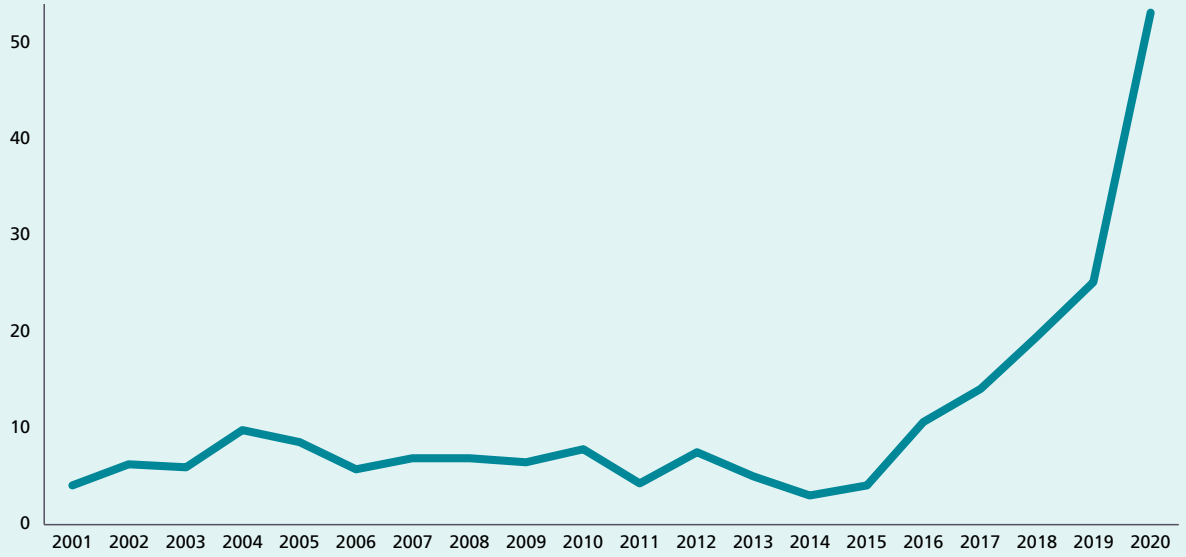
THC content is a key regulatory challenge. THC thresholds for hemp differ by jurisdiction: 0.3% in the USA, Canada, China and the EU, and 1% in Mexico, Switzerland, Australia, and Uruguay, as of 2021 (Adhikary, 2021). Exceeding thresholds means the crop may become, in regulatory terms, a prohibited or controlled drug ('hot hemp'). Hot hemp is a major problem given the variability in crops according to growing conditions. In particular, high sunlight stimulates THC production. In the United States between 2018-2020, 10% of hemp acreage was 'hot' (Singular, 2021), with many European and North American farmers required to destroy crops (Gothrinet, 2022). This has generated pressure for higher regulatory thresholds. In addition, regulation aimed at controlling the risk of hemp production being diverted into illegal drug markets can also present complications for 'whole plant' business models (Neslen and Deutsch, 2020).

While a large and fast-growing global industry, in its raw or semi-processed form hemp does not appear to be traded internationally to a significant degree relative to the size of the industry. Figure 6 shows that in 2020 global trade in hemp was only around US$50 million according to the UN Food & Agriculture Organisation. The traded volume of hemp in 2020 was just 19,000 tonnes (Trademap). In contrast, 152,000 tonnes of hemp was produced in the EU alone in 2019 according to Eurostat (up from 97,000 in 2015), while the US value of hemp production was US$712 million in 2021 (USDA, 2020). The UN Conference on Trade & Development (UNCTAD) has suggested that existing international trade data likely underestimates the value of hemp exports due to limited coverage of hemp products (UNCTAD, 2022). Using data from national statistical agencies, they suggest a figure of US$291 million, though this does not include the large CBD market (UNCTAD, 2022). Much of this trade is understood to be between the United States and Canada, or intra-European (UNCTAD, 2022).

Developing significant hemp farming capacity will likely require a strong focus on domestic and regional markets.

FIGURE 6

Hemp export value, US$ million *(Source: Trademap)*



The combination of an unfavourable value to weight/volume ratio (Allen et al., 2019) alongside established, large-scale hemp farming industries in major markets may pose challenges for realising significant export volumes from hemp cultivation. There is also a range of complex non-tariff barriers to international trade in hemp (UNCTAD, 2022). Developing significant hemp farming capacity will likely require a strong focus on domestic and regional markets. This in turn will require significant investment in processing capacity – another major challenge for farmers in mature markets – and demand creation. These issues are discussed in Section 3.

The inside of a machine that extracts the oil from the hemp plant that will be used for medicinal purposes. (Photo: Tim Thompson / Alamy Stock Photo)

1.4 Summary

There is considerable optimism about the developmental opportunities brought by the growth of a global cannabis industry. However, as this section has shown, there are also major challenges in realising these opportunities, and further that the nature of the challenges and opportunities differ significantly according to the type of cannabis being produced. These are summarised in Table 3:

TABLE 3

Summary of challenges and opportunities in global cannabis markets

Export market potential	Barriers to entry for cultivators	Growth potential
MEDICAL		
High – in particular serving under-supplied European markets.	**High** – requires advanced precision agriculture capabilities; large investments in advanced equipment and skills; there are multiple barriers to accessing export markets, in particular complex regulation. International competition is intensifying.	**High** – large latent demand in domestic markets pending regulatory change; rapid growth in international demand but subject to intensifying competition. Large anticipated future demand from the pharmaceutical industry as R&D advances; shift from dry flowers to more complex products.
INDUSTRIAL (HEMP)		
Low – relatively little international trade; high bulk-density and requirement for proximity to processing; major established suppliers in main markets.	**Low** – Labour intensive outdoor cultivation, more akin to conventional agriculture.	**Uncertain** – A vast potential market but this needs to be unlocked through 'demand creation' interventions to encourage substitution efforts.
ADULT USE		
Non-existent in the short term – prohibited by international drug control conventions.	**Medium to Low** – market is diverse and segmented; capabilities required vary by product category; possibility for small-scale 'artisanal' production.	**High** – large existing consumer market, with formal sector demand to be opened by changed regulation. Advanced markets show significant growth opportunities into more complex value-adding products post-legalisation.

2

THE SOUTH AFRICAN LEGAL AND REGULATORY SYSTEM FOR CANNABIS

The legal status of cannabis has undergone significant changes in recent years. This section outlines key features of the South African legal and regulatory system for cannabis, covering medical, adult-use and industrial cannabis. Alongside this, the section discusses the implications of the system for the shape of the cannabis industry and the prospects for inclusive development. The section also examines the international legal framework for cannabis, which has an important bearing on domestic regulations.

2.1 Adult-use cannabis

Key points

- The Cannabis for Private Purposes Bill (CPPB) seeks to maintain prohibition of commercial adult-use cannabis, while decriminalising cultivation, possession and consumption of small quantities for private-use.
- The Bill is likely to have anti-poor implications in criminalising users that lack private space for use and cultivation.
- Paradoxically, the Bill authorises commercial adult-use cannabis subject to the enactment of future legislation, but the contents of this legislation and timeline to its completion is highly uncertain.
- The illegal cannabis market in South Africa is large and complex. Developing a regulated commercial adult-use cannabis market is essential to realising the economic development potential of cannabis, in particular for providing opportunities for small-scale traditional growers.
- Ending policy uncertainty and developing a regulated, commercial adult-use cannabis market is an urgent policy priority.

Overview of the Cannabis for Private Purposes Bill (CPPB)

Cannabis has been prohibited in South Africa for most of the past century (Nkosi, 2021), most recently under the Drugs and Drug Trafficking Act, 1995 (Drugs Act). However, a landmark 2018 Constitutional Court judgement determined that the Drugs Act's prohibition of private cannabis use infringed the constitutional right to privacy. This resulted in decriminalisation of cultivation and consumption of small amounts of cannabis for private-use, in private spaces. The Court gave Parliament 24 months to create new legislation addressing its ruling. The result was reforms to existing legislation – the Medicines Act, discussed below – and the Cannabis for Private Purposes Bill (CPPB). The CPPB is making its way through Parliament following discussion of a revised draft in April 2022, with the finalisation date uncertain.

Outside private-use exceptions enabled by the Constitutional Court ruling and regulated medical use under the Medicines Act (discussed below), high-THC cannabis remains an illegal substance under the Drugs Act, with commercial trade subject to severe criminal penalties. This includes the illegality of 'grow clubs' in

Outside private-use … high-THC cannabis remains an illegal substance under the Drugs Act, with commercial trade subject to severe criminal penalties.

South Africa following a recent Western Cape High Court ruling (Schindlers, 2022). The CPPB maintains prohibition of commercial adult-use cannabis, while proposing amendments to the Drugs Act that decriminalise cultivation, possession, and use of small quantities of cannabis for adult private-use: 600g in private settings, 100g in public settings, 1200g per dwelling, four flowering plants in private, and one flowering plant in public. Additionally, 100g may be given to others for medical purposes 'without exchange of consideration' (for free). Larger quantities and any commercial activity remain a criminal offence, subject to large potential fines and prison sentences.[15] There are special measures for the Rastafarian faith, enabling a 'cultural or religious community' to apply for permits to cultivate, possess, and supply cannabis in quantities 'reasonably required' by adult community members for cultural or religious practices.[16]

While maintaining prohibition, the revised CPPB contains a new Section 1A authorising commercial adult-use cannabis '[s]ubject to the enactment of national legislation' at an unspecified date. This legislation should give 'due consideration' to:

> '(a) harm reduction;
> (b) demand reduction;
> (c) public education and awareness campaigns in respect of the harms associated with recreational cannabis;
> (d) the prevention of persons under the age of 18 years to access recreational cannabis;
> (e) the prohibition of advertising or promotion of recreational cannabis; and
> (f) population level monitoring of use and associated harms of recreational cannabis.'

Finally, the CPPB also proposes to redefine cannabis in terms of its THC content from the current 0.2% to 2%. This would benefit the hemp industry, given the challenges of maintaining low THC levels in South African growing conditions (discussed below).

Criticisms of the Cannabis for Private Purposes Bill

The CPPB means many users will be able to access cannabis without fear of prosecution. It nonetheless has several potential negative implications and ambiguities, and has been subjected to considerable criticism by industry and civil society stakeholders. Some key issues include:

- It disadvantages low-income cannabis users. People living in densely populated urban areas or communal areas may lack sufficient private space for cultivation and consumption free of the risk of prosecution or police harassment. Indeed, public cultivation is a Class B offence.
- Continued prohibition means continued arrests and criminalisation of users that diminish their life chances, and continued income streams for organised criminal gangs (Pinnock, 2019; Shelly and Sigsworth, 2020). It also means continued diversion of over-stretched criminal justice system resources: between 2013-2019, 15% of arrests were drug related, with a 50% conviction rate (Shelly and Sigsworth, 2020). These problems disproportionately impact poor communities.
- There is an apparent lack of alignment between the CPPB and the Drugs and Drug Trafficking Amendment Bill (2022). The latter maintains prohibition of cannabis plants, which remains listed among the 'undesirable dependence producing substances' for which manufacturing, use, possession, and dealing are criminal offences.

15. For example, cultivating a 'trafficable quantity' is a Class C offence subject to up to 2 years in prison; cultivating commercial quantities of cannabis is a Class B offence subject to up to 4 years in prison; dealing in flowering cannabis plant or possessing commercial quantities is a Class A offence, subject to up to 8 years in prison. Most prison sentences have been reduced by around 50% in the revised version.
16. As set out in Section 1B, 11, c: '"cultural community" or "religious community" has the meaning assigned to it in section 31 of the Constitution and includes a community that primarily consists of members who are adherents of the Rastafarian faith'.

- The CPPB is contradictory in simultaneously seeking to enable and prevent a regulated adult-use cannabis industry. Implementation of Section 1A will require another overhaul of the CPPB, as well as the Drugs Act. In this respect, the CPPB perpetuates rather than resolves regulatory uncertainty for the cannabis industry.
- For reasons discussed below, legal adult-use cannabis markets likely offer the best opportunities for participation by traditional growers and small enterprises. The Section 1A list of issues that new legislation must give due consideration to (a - f above) does not include widening participation or inclusivity objectives. Enabling participation by traditional growers and small enterprises should be a key priority of adult-use regulation, alongside the promotion of sustainability and decent work.

Developing legislation for commercial adult-use cannabis regulation will be a complex task given the range of possible access, models and the need to carefully manage trade-offs between commercial, developmental, criminal justice and public health imperatives (as discussed in 1.1). Enacting this legislation should be an urgent priority.

Overview of South African adult-use cannabis markets

South Africa has a large illegal cannabis industry, with prohibition and harsh criminal sanctions having been ineffective at eliminating either supply of or demand for cannabis. Adult-use is by far the largest cannabis market internationally, and the same is true domestically. The UNODC estimates 3.65% of the South African population are regular cannabis users (Department of Social Development, 2019). This makes cannabis the most widely used illegal drug and the largest illegal drug market by value, though alcohol is the most widely-used legal drug overall (ibid.). Alongside conventional adult-use, some illegal cannabis is consumed in combination with low-grade opioid mixtures (nyaope, whoonga) (Mthembi et al., 2018). Given the dangerous, addictive nature of heroin and the other dangerous substances included in these mixtures (Groenewald and Essack, 2019; Mokwena, 2016), this is a particularly harmful aspect of the illegal cannabis market. The UNODC estimates South Africa's illegal

Demonstrators hold placards during a march calling for the legalisation of cannabis in Cape Town. (Photo: REUTERS / Alamy Stock Photo)

producers cultivate 2,500 tonnes of cannabis per year, making South Africa one of the world's most significant sources of illegal supply (Prohibition Partners, 2019, p37). Alongside the domestic market, South African illegal producers export regionally and internationally (GI-TOC, 2022; UNODC, 2022). There are also imports from regional neighbours, including Lesotho and eSwatini. While much distribution activity in the illegal cannabis industry is controlled by criminal gangs, much cannabis supply incomes from small-scale traditional growers in marginalised rural areas, where cannabis plays an important role supporting livelihoods (Section 4).

The value of the adult-use cannabis market in South Africa was estimated by New Frontier Data (2021) as US$1.2 billion in 2020 (~R20 billion). It forecasts this will grow by 25% to US$1.5 billion in 2025 (ibid.). Other organisations estimate similar figures.[17] These estimates likely include concealed medical demand, since medical cannabis has only recently been legalised and remains hard to access (discussed in 2.2). Birguid (2021) estimates 17% of South Africa's illegal cannabis market is medical use. Table 4 contextualises the adult-use cannabis market value relative to various agricultural commodities. This is not a straightforward comparison since cannabis estimates relate to end-market value, whereas these figures only reflect the farming stage of the value chain. Nonetheless, it illustrates the large scale of the illegal cannabis market. Notably, estimates for the domestic adult-use market value are large in comparison to the European medical cannabis market: US$247 million in 2020 according to New Frontier Data and just over €400 million in 2021 according to Prohibition Partners.

TABLE 4

Comparison of the size of the domestic adult-use cannabis market to selected agricultural commodities

Commodity	2020 Value, R billion
Cannabis	14-33
Wheat	10.4
Soya beans	8
Sugarcane	10
Cotton	8.6
Tobacco	0.6
Apples	9.2
Grapes	16.1
Berries	10.3
Avocados	1.4

Figures for agricultural commodities from DALRRD Abstract of Annual Statistics 2021 for 2020 or 2019/20 production year.

At present, a significant proportion of this value is likely being captured by organised criminals. A regulated legal market could divert it towards formal sector job creation, and potentially generate significant tax revenues. For illustration, the state of Colorado, which has a similar GDP to South Africa,[18] received over US$400 million (~R6.8 billion) in cannabis tax revenues in 2021 (UNODC, 2022). A regulated adult-use market is also important for building an inclusive cannabis economy with opportunities for traditional growers. As well as being large, the illegal adult-use market is diverse and highly segmented. Interviewees suggested the illegal industry contains a wide range of cannabis products of differing quality, including relatively cheap, low-THC, outdoor-grown cannabis produced by traditional growers, often using landrace varieties, and more expensive cannabis produced using hybrid seed varieties in indoor growing systems using advanced cultivation techniques (see also Clarke and

17. The Department of Trade, Industry and Competition and the Agricultural Research Council projected that the cannabis industry in South Africa in 2021 was worth R14 billion and that by 2024, this could double to R28 billion (Vayej and de Lange, 2021). Euromonitor estimated the illegal cannabis market in South Africa to be significantly larger than this at R33 billion in 2020 (Mochiko, 2021).
18. The GDP of Colorado was US$436 billion in 2021, and the GDP of South Africa in 2021 was US$420 billion (current US$) (Data from World Bank, St Louis Fed).

Riboulet-Zemouni, 2021). Riley et al. (2020) show large price differentials between low and high quality cannabis sold to different income groups, with "medium quality cannabis almost twice as expensive as low quality cannabis", and "high quality cannabis nine times more expensive". This segmentation suggests that, dependent on regulation, a legal adult-use market could provide opportunities for a wide range of business models, with smaller growers supplying low-complexity or niche products, operating in market segments with less competition or lower entry barriers. Trends in artisanal cannabis production in North America also highlight such potential (Section 1.1). As discussed below, participating in hemp and medical cannabis value chains is likely to be more difficult for traditional growers and small enterprises given the regulatory and financial barriers to entry, the structure of the value chain, and the nature of competition.

2.2 Medical cannabis

Key points

- The formal domestic medical cannabis market is currently small due to the complex, costly, and time-consuming nature of getting a prescription.
- There is likely to be significant latent demand for medical cannabis, which should be unlocked with a more streamlined process.
- South African medical cannabis producers would likely benefit from a larger domestic market as an alternative to dependence on export markets.
- The licensing system for the production of medical cannabis is strict and complex. The requirements mean that medical cannabis production entails significant access to capital and effectively excludes smaller producers.
- Addressing this is challenging due to the constraints of adult-use prohibition, the interpretation of international drug control conventions, the requirements for safety and consistency in medical products, and the need to align with international standards to maintain export market access.

Regulation of medical cannabis

Legalisation of high-THC medical cannabis in South Africa was enabled by amendments to the Medicines and Related Substances Act, 1965 (Medicines Act) coming into force in 2018, and the 'rescheduling'[19] of cannabis in the Medicines Act in May 2020. This involved:

- THC moving from Schedule 7 (no legitimate medical applications) to Schedule 6, when used for therapeutic purposes. This enabled practitioners registered under the Health Professions Act 1974 to prescribe cannabis, and for high-THC cannabis products to be cultivated/manufactured subject to obtaining a licence from the South African Health Products Regulatory Authority (SAHPRA).
- The de-scheduling of raw or industrial cannabis products containing below 0.2% THC, processed products containing below 0.001% THC, and raw plants containing THC when 'cultivated, possessed and consumed by an adult, in private for personal consumption'.
- CBD moving from Schedule 4 to Schedule 0 when there is no more than 600mg CBD per sales pack and a maximum daily dose of 20mg CBD, or when processed products made from raw plant material for ingestion contain no more than 0.0075% CBD. The move to Schedule 0 means such products can go on general sale. Beyond these exceptions, CBD has remained a Schedule 4 substance, meaning significant restrictions barring prescription by registered medical practitioners or industrial uses.

(Department of Health, 2020; Greenhouse Project, 2021; SAHPRA, 2019).

19. "The Medicines Act categorises drugs and medicinal substances into eight groups, from Schedule 1 to Schedule 8, with Schedule 8 being the most toxic substances with the highest level of restricted access." (Bulose, 2022)

Multiple interviewees from the cannabis industry and civil society organisations expressed concerns that the prescription process is expensive and time-consuming for practitioners and thus restricts access for patients

Patients' access to medical cannabis

Pending reforms proposed in the CPPB discussed above, high-THC or high-CBD medical cannabis can only be legally accessed through a prescription from licensed medical practitioners or authorised prescribers who have applied for permission from the Medical Control Council under Section 21 of the Medicines Act (Greenhouse Project, 2021). This is required because there are no registered medical cannabis products, and prescription of unregistered medicines requires a Section 21 application on behalf of patients. Applications must justify the patient's need and exceptional circumstances, and there are significant reporting requirements (SAHPRA, 2021). Multiple interviewees from the cannabis industry and civil society organisations expressed concerns that the prescription process is expensive and time-consuming for practitioners and thus restricts access for patients. The first legal medical prescription was issued in September 2021, and interviewees suggested there are still relatively few examples of prescriptions being approved. This means the formal domestic medical cannabis market is very small at present (Birguid, 2021; Prohibition Partners, 2021), and it is likely that medical users are accessing cannabis illegally or through home cultivation. This situation also makes South African legal medical cannabis producers dependent on export markets, weakening their bargaining power and amplifying risks (Section 3). The system also means traditional medicine practitioners, who have used cannabis for centuries, continue to lack legal means to use the plant (Lewis, 2020).[20] Reforms to streamline the prescription process could unlock latent demand for legal medical cannabis, allow users in need to access high-quality medical cannabis, and enable traditional medicine practitioners to operate without risk of prosecution.

In contrast to medical cannabis, the domestic market for Schedule 0 CBD complementary medicines has been growing rapidly, and has been a target for listed firms with branded CBD wellness products and retail operations. CBD products are now commonly available in shops. The industry has suggested there are challenges with the clarity of regulations and product standards, and that CBD dosage and THC limits are constrictive and unnecessarily low (Prohibition Partners, 2022). A landmark 2018 review by the World Health Organisation found 'there is no evidence of recreational use of CBD or any public health-related problems associated with the use of pure CBD' (WHO, 2018). A lack of clarity over product quality standards and consumer protection measures is a challenge shared across the hemp industry internationally, and policy-makers should seek to address this domestically and in coordination with key international trading partners (UNCTAD, 2022). Constraints on cannabis cultivation and processing mean, according to several interviewees, that most CBD oil is imported.

Medical cannabis production

Legal cultivation and manufacturing of medical cannabis products requires a licence from SAHPRA under Section 22C of the Medicines Act, and a permit from the Director General of Health under Section 22A of the Medicines Act (SAHPRA, n.d.). Alongside licensing, SAHPRA provides regulatory oversight of medical cannabis. Different licences cover cultivation, Active Pharmaceutical Ingredient (API) extraction, manufacturing, importing/exporting, and distribution (ibid.). According to the SAHPRA website at the time of writing, 74 cultivation licences have been issued. Data is not available on overall volumes, production values, employment etc. Examination of publicly available information and interviews with industry experts and cultivators show there are a wide range of business models. However, some general trends are apparent. Though some firms are investing in value-adding processing of extracts and manufacturing of finished products, the industry appears predominantly oriented towards dried flower export. Many cannabis operations

20. Interviews Jason O'Donoghue and Ricky Stone.

Licensing conditions make medical cannabis production an expensive and complex activity, more akin to pharmaceutical manufacturing than conventional agriculture. Obtaining a licence requires significant access to patient capital.

have been founded by entrepreneurs already engaged in high-value horticulture, in which there are many related capabilities (Section 3). Licence holders must meet complex and extensive regulatory requirements. For cultivation, these align with international Good Agricultural and Collection Practice (GACP) standards. For post-harvest activities, licence-holders must meet SAHPRA's Good Manufacturing Practice (GMP) standards. They must also have a range of security and traceability measures to prevent diversion of cannabis into illegal markets.

Licensing requirements include:

- A high-security facility to prevent unauthorised access, cross-pollination, or contamination.
- Extensive internal security and hygiene measures, including access control systems, security pass controls for movement between sections of the facility, two or more layers of climb-proof fencing, CCTV systems, and intruder alarms.
- Registration of seeds used, area cultivated, details of all products, packaging, and activities carried out.
- Record keeping on every aspect of the production process, records of standard operating procedures for every aspect of the production process, full traceability in the supply chain, and data integrity.
- Secure systems for storage and end-to-end transport of cannabis.
- Submission of analytical tests for quality control and safety (e.g. pesticides, heavy metals, moulds, bacteria).
- Reporting of production volumes and production forecasts.
- Taking 'all reasonable steps' to prevent staff diverting cannabis to non-medical uses, including not employing anyone convicted of a serious offence.
- Securing offtake agreements from international buyers prior to the award of a licence.

(SAHPRA, n.d.)[21]

There are other licence requirements besides these. Producers must also obtain export permits domestically and, via SAHPRA, from the International Narcotics Control Board (INCB), which allocates national annual production quotas according to submissions made by government agencies (Rossi, 2021). These licensing conditions make medical cannabis production an expensive and complex activity, more akin to pharmaceutical manufacturing than conventional agriculture. Obtaining a licence requires significant access to patient capital. While the application fee is R25,000, the investment required for greenfield facilities runs into tens of millions of Rands, with interviewees suggesting a range of R20 million to R100 million. Furthermore, this investment is high-risk, given the multiple regulatory and market access uncertainties facing medical cannabis producers (Section 3), and the long lead-times. The gap between initial investment revenue generation can be several years. The first South African medical cannabis exports were only sent out in June 2021 (Jordan, 2021), and interviewees suggested relatively little cannabis has been exported since, despite the large numbers of licences awarded. Interviews with licence-holders revealed concerns about considerable delays in approval processes, paperwork, and responses to queries due to SAHPRA being seemingly under-resourced. These circumstances make medical cannabis challenging even for deep-pocketed agribusiness. For small-scale producers lacking good access to capital and for traditional growers, the barriers to participation in the value chain may be near insurmountable. Among organisations representing small producers there is considerable anger about the exclusivity of these arrangements and the predominantly

21. Interviews with licensed cultivators.

white ownership of the emerging formal cannabis industry, as reflected in protests led by the Black Farmers' Association of South Africa (McCain, 2022). SAHPRA has become a lightning rod for criticism among multiple industry stakeholders, and interviews suggest there is widespread mistrust.

Changing these exclusionary outcomes would require different licensing arrangements and carefully targeted state support (discussed in Section 4). However, it is important to recognise broader external constraints on regulatory options. As SAHPRA notes, rigorous traceability and security requirements reflect the South African government's interpretation of its obligations as a signatory to the United Nations Single Convention on Narcotic Drugs, enabling reporting of cannabis production to the INCB and preventing diversion of cannabis to illegal markets (SAHPRA, n.d.). Diversion control is also necessitated by prohibition of commercial adult-use cannabis under the Drugs Act. Further, high quality standards are essential for medical products, to ensure 'therapeutic properties of the end product are constant and reproducible', and that products are safe and free of contaminants (SAHPRA, n.d.). Finally, as discussed in Section 3, meeting high regulatory standards is a condition of entry to major export markets. A licensing system that aligns with dominant international standards and is trusted by international buyers and regulators is a key competitive advantage. Looser standards may jeopardise this. As recent challenges in the South African citrus and wool industries show, negative importer perceptions of sanitary and phytosanitary standards – justified or not – can severely jeopardise international market access (Coleman, 2022; Vecchiato, 2022). A more inclusive regulatory and licensing system requires changes to adult-use cannabis, and potentially a different approach to international conventions (discussed in 2.4 below). An alternative to looser overall licensing conditions may be a tiered cultivation licensing system, in which smaller producers can participate in the medical cannabis value chain under less onerous licensing conditions with offtake and supervision arrangements from larger producers responsible for maintaining standards and quality assurance (discussed in Section 4).

2.3 Industrial cannabis (hemp)

Key points

- Legal commercial hemp production is still in its infancy with a permit system introduced in late 2021.
- The regulatory system appears oriented towards diversion control imperatives, at the expense of inclusivity. Hemp permits will be difficult for small-scale producers and traditional growers to obtain. Reforms should seek to lower barriers to participation in the industry.
- The 0.2% THC threshold for industrial hemp is considered too low for South African agro-ecological conditions, and is expected to create problems with 'hot hemp'. This threshold should be raised.
- The regulatory system is generating uncertainty and constraining supply. It also prevents the adoption of dual or multi-use cultivation systems, which may have an important role in inclusive rural development.

Reforms in 2021 made hemp an agricultural crop under the Plant Improvement Act (1976) enabling it to be legally cultivated and traded (DALRRD, 2021). Hemp in South Africa is cannabis cultivated for 'agricultural and industrial purposes' with THC content not exceeding 0.2% (DALRRD, n.d.). Hemp production is regulated by DALRRD's Plant Production Directorate, who issue permits for cultivation, distribution, and propagation. Permit documentation was only published in October 2021, and so the hemp industry is less advanced than medical cannabis. The NCMP and several provincial governments view hemp production as a key means to enable participation in the legal cannabis industry by small-scale producers and traditional growers. While less onerous than medical cannabis licensing conditions, hemp permits will also be difficult for small producers to obtain.

The regulations create multiple difficulties for participation by small producers in terms of the costs and complexity of production – far in excess of those required for conventional agricultural value chains in which there are already major challenges with smallholder participation. Fencing and security requirements not only add costs, but may complicate production on communal land. Criminal record requirements will exclude some traditional growers prosecuted for cannabis activities in the past. The regulatory system appears oriented towards diversion control imperatives and policing the 0.2% THC threshold, at the expense of inclusivity. Adult-use cannabis prohibition could therefore be seen as the ultimate source of key constraints on inclusive development in hemp. Creating regulated adult-use markets may mean that extensive diversion-control measures constraining hemp production can be relaxed. As with medical cannabis, there is a need to consider tiered permit arrangements with regulatory compliance burdens shifted downstream in the value chain.

There are several other important challenges with the regulations:

- The requirement to use only registered hemp varieties prevents traditional growers from using landrace varieties, and means reliance on expensive imported seed varieties (seeds are a major input cost in hemp production). Several interviewees raised concerns that this also creates a contamination risk for landrace cannabis varieties, which as discussed in Section 4 are potentially valuable indigenous knowledge assets.
- Interviewees suggested that maintaining 0.2% THC levels in South African conditions would be extremely difficult. Plants exceeding the threshold transform from hemp into an illegal narcotic that producers must destroy. The 'hot hemp' challenge (Section 1.3) is viewed by industry stakeholders as likely to be severe in South African climatic conditions. Given that high UV levels stimulate THC production, interviewees suggested it would be difficult to abide by the 0.2% threshold, in particular when reliant on seed varieties developed for northern hemisphere conditions. The 0.2% threshold is now low by international standards, with multiple jurisdictions adopting significantly higher levels. For example, the EU recently raised its threshold to 0.3%, while 1% is used in Australia, Switzerland, and Uruguay. The most recent draft CPPB suggested a higher 2% THC limit definition for cannabis, and this should be adopted as soon as possible to prevent uncertainty. Some experts recommend focusing regulation of THC content in finished or intermediate products derived from hemp, where THC quantities can be more easily controlled, rather than at farm level (UNCTAD, 2022), and this may have particular benefits for lowering barriers to participation by small-scale hemp farmers.

A three-year hemp cultivation permit involves meeting requirements which include the following:

- All premises must be registered, with cultivation areas, 'sufficiently fenced with controlled access'.
- Cultivators must keep extensive logbook records for inspection, and annual reports detailing all activities, including registered cultivars used, harvest volume, and clients supplied.
- Planting notices must be submitted to the Registrar, SAPS, and DALRRD's inspection service, with officials able to inspect at the farmer's cost at 'regular intervals for monitoring and sampling' of THC content.
- Distributing harvested crops requires transport declarations, copies of cultivation permits, and packing list/ consignment invoices.
- Applicants must declare criminal records. Those with records for serious drug offences are not eligible for permits.
- Applicants must demonstrate 'suitable qualifications, skills and/or experience to conduct the activities specified in the permit'.

(DALRRD, n.d.)

- Further challenges relate to realising the value of CBD: As discussed in Section 1, hemp plants commonly contain lots of CBD, and in Europe and North America many hemp farmers produce specifically for CBD markets. Indeed, in the United States, this is the most profitable form of hemp production. Though specialisation can be expected in the long-term, there is potential for multi-use cultivation strategies to benefit small-scale producers and minimise risks, particularly at early stages of industry development (UNCTAD, 2022). However, farmers producing hemp under a DALRRD permit cannot utilise flowers for CBD production, which falls under a SAHPRA licence (Louw & Coetzee, 2022). Correspondingly, medical cannabis varieties contain useful stalks and fibres, which producers must destroy. For ecological sustainability and enabling producers to realise the full value of their crops, this should be resolved to enable multi-use business models.

Alongside the constraints of the regulation on hemp supply, the major challenge for the hemp industry is limited demand. Interviewees expressed concerns about the lack of domestic hemp processing capacity, and for reasons discussed in Section 1.3, export opportunities appear limited at present. Addressing these challenges is discussed in Section 3.

2.4 The international legal system

Key points:

- The South African government appears to be adopting an overly conservative interpretation of key international drug control treaties.
- This places major constraints on the development of domestic and export markets.
- International experience over recent years shows there is scope for a more flexible approach.

It is important to briefly consider international drug control conventions to which South Africa is a signatory. Interpretations of these conventions have shaped existing drug laws and regulations (Scheibe et al., 2020), and have sometimes been cited by officials and policymakers as preventing legalisation of commercial adult-use cannabis (Department of Social Development, 2019; DALRRD, 2021). The key international conventions are the United Nations Single Convention on Narcotic Drugs, 1961 (the Single Convention), the complementary Convention on Psychotropic Substances, 1971, and the Convention Against Illegal Traffic in Narcotic Drugs and Psychotropic Substances, 1988. The conventions seek to prohibit production and trade of drugs except under licence for medical or scientific purposes. Cannabis was removed from Schedule IV of the most dangerous narcotics in 2020, but remains in Schedule I, meaning use of cannabis for non-medical and non-scientific purposes 'will continue to remain illegal' (UN News, 2020; Firestone, 2019). The conventions also require adherence to cannabis production quotas and reporting requirements to the INCB. Relative to countries at the frontier of cannabis reforms, the South African government appears to have a conservative interpretation of these conventions.

Adult-use legalisation reforms such as those carried out in Uruguay, the United States and Canada (Section 2.1) have been described by the INCB (2020, 121) as:

> "…fundamentally inconsistent with the obligations of States parties to the drug control conventions and [constituting] a serious violation of the conventions. Irrespective of the justifications advanced by the States in question, of their expressed commitment to the 'general objectives' of the drug control conventions and of whether these initiatives are characterised as 'experiments', it remains that the legalisation and regulation of controlled substances for non-medical purposes is a clear violation of the international drug control legal framework and undermines respect for the agreed international legal order."

In practice, there is implicit tolerance for differing interpretations of the conventions, the letter of which is lagging behind a reality in which the effectiveness of drug prohibition is increasingly called into question

Countries legalising adult-use cannabis have faced INCB criticism, but not punishment (Riboulet-Zemouli, 2022). Legal experts and advocacy groups suggest there is scope for greater flexibility in interpretation of the Conventions according to signatories' 'constitutional limitations', respect for fundamental human rights, public health considerations, and traditional cultures (Clarke and Riboulet-Zemouni, 2021; Riboulet-Zemouli, 2022; Scheibe et al., 2020). For example, the Uruguayan government argued cannabis prohibition contradicted its obligations to international human rights treaties, which should take precedence (Walsh and Ramsey, 2016). The Bolivian government repudiated aspects of the Single Convention to enable protection of indigenous cultural heritage involving coca leaf consumption (Bewley-Taylor et al., 2014). Providing that constitutional imperatives for reforms are substantiated, legislation is democratically conceived, legalisation arrangements include harm-reduction measures and do not disadvantage other states, some legal experts suggest scope for departure from conservative interpretations of the Single Convention (Clarke and Riboulet-Zemouni, 2021; Riboulet-Zemouli, 2022). In practice, there is implicit tolerance for differing interpretations of the conventions, the letter of which is lagging behind a reality in which the effectiveness of drug prohibition is increasingly called into question. The incongruity signals an urgent need for global dialogue on renewing the institutional framework for global cannabis trade (Bewley-Taylor et al., 2020). Scheibe et al. (2020, 274) argue the South African government's stance has perpetuated prohibitionist approaches, and that the Convention should be 'challenged to prioritise rights and health'. Besides the significance to domestic adult-use cannabis markets, the Convention's prohibition of international trade in non-medical/scientific/industrial cannabis limits opportunities for small-scale growers to participate in export markets (Bewley-Taylor et al., 2020).

Police officer placing handcuffs on suspect after a drugs raid.
(Photo: Michael Matthews - Police Images / Alamy Stock Photo)

3

GROWTH, COMPETITIVENESS AND DECENT WORK: ADDRESSING KEY CHALLENGES IN HEMP AND MEDICAL CANNABIS PRODUCTION

Key points

- Medical cannabis producers face several acute, near-term regulatory challenges with international market access. Government must assist producers by addressing key bottlenecks and seeking regulatory alignment and harmonisation of standards with key export markets.
- In hemp, lack of processing capacity and end-market demand are key immediate challenges. Alongside supporting investment in processing, government should consider demand-side industrial policy measures, using public procurement or incentivising substitutions for hemp-based products where there is an environmental or developmental benefit.
- Longer-term, a key challenge is avoiding commoditisation pressures and building competitive capabilities in high-value activities in the cannabis value chain. Systematic research is needed to identify activities with the highest developmental potential and target industrial policy support. Initial research suggests backward linkages into the supply of inputs, equipment and genetic material is an important area for further investigation.
- Long-term international competitiveness will depend on the quality of the sectoral innovation system for cannabis and coordinated sectoral governance. At present there are significant gaps in capacity and challenges with fragmented governance. Consideration should be given to a specialised state agency for coordination of regulation and support for development of the cannabis industry. This would also help build state expertise. Additionally, a representative industry association may provide benefits for governance and mobilising resources for collective services.
- High labour and environmental standards are important to realising the developmental potential of cannabis, and to the industry's long-term competitiveness. Stakeholders should seek to develop shared minimum industry standards for decent work and sustainability, operationalised through a certification scheme or embedded in licensing conditions.

Introduction

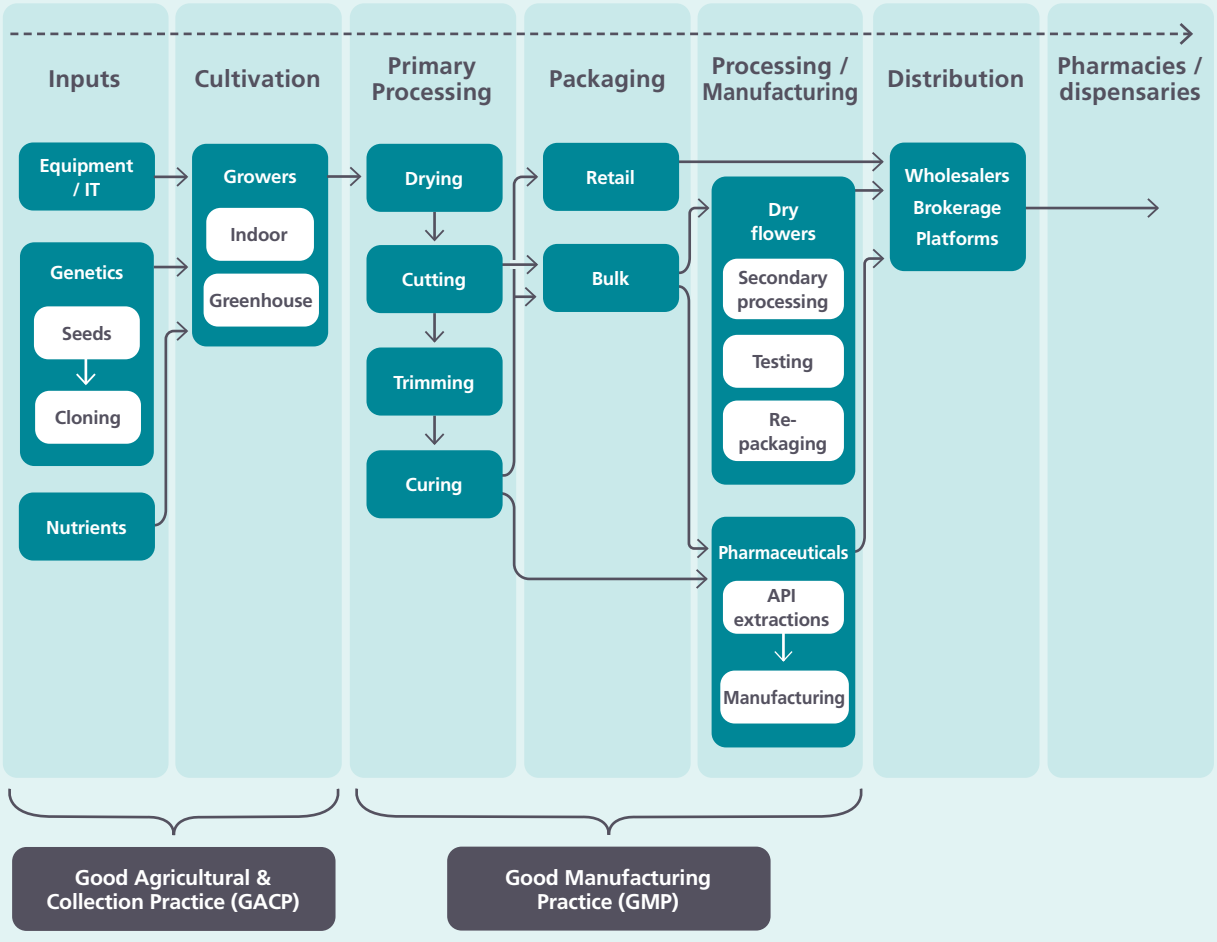
This section analyses some key challenges facing the existing formal cannabis industry (hemp and medical). For medical cannabis, in the short term this means overcoming key international market access challenges. In hemp, the major challenge is establishing a domestic value chain through investments in post-harvest processing, and leveraging domestic demand. In the longer-term, challenges relate to avoiding the risks of commoditisation by institution building to support innovation and upgrading into higher value-added products. Realising the developmental potential of the cannabis industry will also require establishing conditions for decent work and sustainability in cannabis production.

3.1 The medical cannabis global value chain

There has been considerable investment in export-oriented medical cannabis production in South Africa, with over 70 cultivation licences granted. A growing number of cultivators are succeeding in producing dry flowers for export. Before discussing export market access challenges, the following section provides a contextual overview of medical cannabis production. Figure 7 provides an overview of the value chain.

FIGURE 7

The medical cannabis value chain



The technological complexity of controlled-environment medical cannabis cultivation creates extensive backward linkages. Facilities require specialised equipment, computer systems, and skilled staff, to control key production variables

Medical cannabis production

Export medical cannabis cultivation is a form of precision agriculture, typically carried out either in controlled-environment greenhouses, mesh covers, or fully-indoors under LED lights. A controlled environment is a licensing requirement, but also necessary for a medical product that is contaminant-free and chemically consistent – though this consistency is more important producing dry flowers for direct consumption than flowers for extracts. Medical cannabis users are increasingly discerning, with online review forums analysing the minutiae of dry flower characteristics in a manner similar to high-end wine or whisky. Interviewees suggest the use of 'cannabis sommeliers' is widespread. Accessing high-value dry flower markets requires buds with an appealing appearance, flavour, and aroma ('bag appeal'). Achieving consistency in sensory attributes necessitates additionally high levels of precision. Interviewees and analysts predict further momentum towards higher and more complex quality standards and consumer demands in the coming years as supply constraints ease (Prohibition Partners, 2022).[22]

The technological complexity of controlled-environment medical cannabis cultivation creates extensive backward linkages. Facilities require specialised equipment, computer systems, and skilled staff, to control key production variables: including light, temperature, humidity, CO^2 levels, and access to water and specialised nutrients. Cannabis plants are sensitive, with small changes in these variables creating large differences in crops. Some cultivators prefer fully indoor grows, while greenhouses require LEDs to adjust for natural light

The pharmaceutical production of smokeless Cannabis products and delivery systems in Israel. (Photo: Nir Alon / Alamy Stock Photo)

22. Interview 22.

fluctuations, alongside electrical ventilation, temperature and humidity control systems. Medical cannabis production is therefore generally very energy-intensive. Cannabis plants are also vulnerable to pests/fungi and absorptive of pollutants, requiring regular inspections and lab testing. These factors combined makes medical cannabis a skill and labour intensive activity. Finally, cultivators also require specialised genetic material. There is a vast range of cannabis varieties, with different cannabinoid, terpene and flavonoid profiles, different grow cycles, and adaptations to different conditions. Consistency imperatives mean that rather than growing from seed, cultivators produce from clones or tissue cultures (Adhikary et al., 2021), with some producing these in-house and some purchasing from specialised suppliers.

South African cultivation licence holders are diverse in terms of routes to entry. A notable pattern apparent from publicly available information and interviews is that many successful firms have entered cannabis from horticulture agribusinesses producing vegetables, berries, grapes and such like. Some examples are listed in Table 5. Many core production capabilities required for medical cannabis cultivation outlined above are similar to those required for high-value export horticulture, where the 'industrialisation of freshness' has made the industry increasingly technology-intensive (Cramer et al., 2022, 2020; Chisoro-Dube and Roberts, 2021). Interviewees also suggested horticulture exporters have useful experience managing complex regulatory, SPS, and logistical challenges required to export (discussed Section 3.2).

TABLE 5

Examples of horticulture producers entering medical cannabis

Licence holder	Engaged in/linked to
Felbridge	Strawberries
Rascal Seed Research Laboratories	Potato tubers
Zandrivier Boerdery	Vegetables / peppers
Farma Growers Group	Vegetables
FirstGrowth	Wine
Elpasso Farms	Vegetables
Leaf Botanicals (75% owned by Labat)	Table grapes, raisins, pecans
Sweet Water Aquaponics	Vegetables
Chroni-Co	Citrus

Post-harvest processing and distribution

A short growing cycle and artificial lights mean harvests can take place multiple times per year. After harvest, plants move into facilities regulated under GMP standards for drying, cutting, and then trimming to remove buds from stalks and leaves. Much processing can be automated using specialised machinery, which is reportedly now widespread in Europe and North America and being adopted in South Africa,[23] but some producers prefer using skilled manual labour. Buds are then cured and vacuum packed. To meet GMP standards, this takes place in ultra-sterile and controlled environments with specialist security and ventilation/decontamination systems. Specialised laboratory testing by SAHPRA-licensed labs is required before dispatch. Flowers may then go into several different value-adding channels: processing to make extracts/concentrates of varying refinements, isolates for pharmaceutical manufacturing, or re-packaging for end-users. How medical cannabis reaches end-users depends on the regulatory system. Interviewees suggested cannabis wholesalers and distribution platforms were playing an important role in major export markets, intermediating producers, manufacturing firms and dispensaries.

23. Interview 19.

Downstream of cultivation, there are important opportunities to produce value-added and branded manufactured products, including extracts/concentrates, vaping products, lotions, and edibles.

Inter-firm relations in the medical cannabis GVC

This subsection considers structural features of the medical cannabis GVC from the perspective of South African cultivators and their bearing on inter-firm power relations and the distribution of value. The medical cannabis GVC is still emerging and in a state of organisational flux. There is a wide range of business models, and it is difficult to talk about 'typical' firms within clearly demarcated chain segments as in more mature industries. There is considerable uncertainty around 'make or buy' decisions for cultivators. It is however apparent from interviews and analysis of public information on large firms that many cultivators – in South Africa and internationally – are pursuing vertical integration, both backwards and forwards. This is with the expectation that in the long-term the best returns will be achieved through control of intangible assets (brands, intellectual property, hard-to-copy knowhow) in more innovation-intensive, 'rent rich' (Kaplinsky and Morris, 2016) activities adjacent to cultivation.

In terms of backwards vertical integration, development and supply of cannabis genetic material is a key focus. Some cultivators produce their own propagation material in-house to save input costs and increase control over their product. This involves growing multiple 'mother' plants from seed and experimenting to find the optimal mother in terms of vigour, yield, resistance to moulds, etc., with clones produced from cuttings, and tissue cultures cultivated in a medium. Producing quality propagation materials is a highly-skilled, complex activity (Adhikary et al., 2021), and as such there are specialist suppliers to address this. Interviewees suggested it is a high-value activity in itself, with propagation material traded internationally and used under licensing arrangements. Some South African firms are engaged in this activity, and reportedly already exporting. Deeper backwards vertical integration involves R&D to breed new cannabis varieties with unique traits. This can have several purposes. Firstly, varieties can be adapted to specific growing conditions to increase productivity. Secondly, new varieties enable product differentiation and the creation/capture of innovation rents from branding and intellectual property (though as discussed below, there is considerable uncertainty over intellectual property protection in the cannabis industry). As medical and adult-use cannabis markets become increasingly complex and research on the medical properties of cannabis progresses, experts expect an increasing shift away from a narrow focus on high-THC or CBD content towards other cannabinoids, terpenes, flavonoids, and their effect on patients in combination (the 'entourage effect'). The importance of genetics innovation and control over intellectual property rights thereof will likely be a key focal point for value capture. This 'deep' backwards vertical integration is already a feature of many major cultivators in Canada, the United States and Europe. For example, firms such as Aurora, Bedrocan, Tilray and Canopy Growth have developed multiple unique, branded strains, for both medical and adult-use markets. In South Africa, an example is Labat, whose subsidiary, Ace Genetics, is seeking to map African cannabis strains and develop new varieties (Moodley, 2022; Slater, 2020). Another is Medcan, who developed the Isando strain, which is sold in export markets and has been bred for high THC content and a specific terpene profile (MedBud, n.d.).

Downstream of cultivation, there are important opportunities to produce value-added and branded manufactured products, including extracts/concentrates, vaping products, lotions, and edibles. In more mature markets, major firms have also commonly vertically integrated in this manner, in particular for the CBD complementary medicine market. Vertical integration between manufacturing and cultivation appears to be driven in part by concerns for the former about ensuring reliable access to quality inputs. Interviewees and public statements from South African medical cannabis producers suggest domestic firms will also pursue this strategy. There are also international examples of forward vertical integration between distribution and cultivation – given retailers/dispensaries are understood to typically achieve large mark-ups – with some large

The learning curve for new entrants is steep, and given the sunrise status of the industry, information on technology, production techniques, and how to handle regulatory challenges is hard to source.

producers in the North running distribution and retail operations. In South Africa, the Goodleaf-Highlands Investments merger is a key example of this form of vertical integration (Highlands Investments, 2021).

In terms of power relations in the value chain, all interviewees among South African cultivators suggested there are significant bargaining power imbalances in the favour of buyers from major international markets. Despite much media coverage and market analysis suggesting supply shortages, obtaining offtake agreements appears difficult. Interviewees suggested that the high levels of regulatory uncertainty, the novelty of the activity, the specificity of buyers' requirements, and concerns about the amount of low-quality cannabis in circulation and unreliable suppliers, means buyers are cautious. There are also an increasing number of suppliers entering the market (Section 3.4). Rather than a 'market' or modular style of value chain governance (Gereffi et al., 2005), in which cultivators produce a relatively standardised product according to easily codified specifications for arms-length transactions, value chain governance appears either 'relational' or 'captive' in nature, with close buyer-supplier relationships based either on trust and extensive information-exchange, or hierarchical control. Some European distributors/platforms – the German platforms Cantourage and Canasativa being a frequently cited example – reportedly develop close ties with favoured producers to increase security of supply, assisting them with passing regulatory hurdles, improving product quality, and co-investment. As discussed in Section 3.2, key regulatory challenges amplify power imbalances in buyers' favour.

There is little publicly-available data on prices, costs, and margins in the chain. This should be a key focus of future policy research. Nonetheless, desk research and interviews enable some tentative observations. Even for dry flowers, there is a significant margin between 'farm-gate'-type prices for wholesale cannabis flowers and the end consumer price. Wholesale prices at the time of the research were around €2-4 per gram, having dropped considerably over recent years, while cannabis flowers from dispensaries could sell for upwards of €20 per gram. As in many other agricultural commodities, higher profit margins seem to be achieved among dispensaries/distributors that intermediate access to consumers. As discussed further below, for South African producers, regulatory obstacles to European markets increase the power of such intermediaries. Processed cannabis extracts fetch higher prices – for example, Komand Consulting (2020) estimates that per milligram of THC, isolates and extracts fetch 7-9 times the price of cannabis flowers. Greater supply constraints mean it is possible to achieve higher margins in this activity currently (Prohibition Partners, 2022).

3.2 Short-term challenges for medical cannabis

The medical cannabis export industry has the potential to generate a range of developmental benefits including export revenue, skilled employment, and industrialisation spill-overs. However, there are major challenges with export market access.

Meeting and verifying quality standards

As discussed above, medical cannabis production is extremely demanding in terms of quality requirements. The learning curve for new entrants is steep, and given the sunrise status of the industry, information on technology, production techniques, and how to handle regulatory challenges is hard to source. Meeting quality requirements also requires skilled labour, which interviewees suggested is in short supply. Proving

produce meets export quality and safety standards requires laboratory testing, and interviewees identified inadequate lab testing capacity and proficiency as a critical bottleneck. Labs need to be SAHPRA-licensed to test cannabis, and reportedly only two were approved to do so at the time of the research.[24] This creates delays. Additionally, multiple interviewees reported problems with inconsistent results. This is a common challenge for biomass testing, amplified in a young industry.[25] A number of policy interventions may help address these challenges:

- An information/advisory hub providing basic guidance for new entrants. Alongside state experts, this could draw on significant expertise among emerging cannabis industry associations and consultancies, and on expertise from South Africa's export horticulture industry in which, as discussed above, there are considerable capability overlaps.
- Increasing laboratory capacity and proficiency through expediting licence issuance or providing financing/incentives for increased capacity.
- Supporting development of, and access to, specialised training programmes to accelerate skills development. There are initiatives to build upon, for example the Cheeba Cannabis Academy's and Agricolleges International's National Certificate In Plant Production – Cannabis & Hemp, a 1 year NQF 4, AgriSeta accredited course (Cheeba Africa, 2022).

Clearing regulatory hurdles

Export market access requires multiple permits and licences, domestically and internationally. Domestically, producers must obtain SAHPRA licences and export permits. Internationally, exporters must meet the regulatory requirements of the importing country. SAHPRA licences are not currently recognised by key importers. As discussed in Section 2.2, SAHPRA licences are demanding and costly, but looser licensing requirements may risk being counter-productive: improved international market access will likely require greater alignment with international standards with the aim of attaining mutual recognition agreements (MRAs) for South African licences. Industry interviewees stressed that a reputation for strict and rigorous regulatory institutions is a key competitive advantage in international markets. Nonetheless, there are widespread concerns about severe delays in licensing processes, paperwork, and responses to queries, which some firms reported had held up export dispatches. This was perceived to stem from lack of capacity at SAHPRA. Increasing capacity at SAHPRA and examining areas in which licensing processes can be streamlined without jeopardising standards should be a key priority.

In terms of international regulatory hurdles, the key challenges relate to GMP standards. Licensing arrangements require producers to meet GACP standards for cultivation activities, and GMP standards for post-harvest activities. GACP is a relatively harmonised, universal standard based on World Health Organisation guidelines for medicinal plants (Falade, 2022). GMP standards are more heterogeneous. EU-GMP standards are set by the European Medicines Agency (EMA), and entering the EU market means demonstrating EU-GMP compliance (EMA, 2018). The importance of European markets means EU standards may become de facto global standards (Hudock, 2021). There is therefore a scramble among global cannabis exporters to gain EU-GMP licences and approvals (Hudock, 2021). However, while the EMA's GMP guidelines seek to harmonise EU member states, their implementation – including registration of producers, awarding of licences, audits, approval of consignments, etc. – depends on 'national competent authorities' (NCAs) at member state level (EMA, 2018; Falade, 2022). NCAs are also responsible for inspecting/auditing (or delegation thereof) production facilities outside the EU, in the absence of an MRA. There is wide variation in how NCAs interpret and apply EMA EU-GMP guidelines, how medical cannabis is classified, and the additional monograph standards applied (ECA Academy, 2020; Falade, 2022). Obtaining EU-GMP certification is extremely costly and time-consuming. Few medical cannabis firms outside the EU have done so. Depending on the

24. Interview Jeff Verlinden.
25. Interview 24.

type of GMP licence, this can require an inspection by the NCA's inspectors or an authorised organisation. There are lengthy delays to organising such visits (Falade, 2022). Interviewees suggested time frames for EU-GMP certification in years rather than months, and requirements to rebuild facilities that had gained SAHPRA licences in order to meet differing EU-GMP requirements. Some European importers are helping non-EU suppliers gain EU-GMP certification.[26]

There are still ways for South African producers to get cannabis into EU markets without EU-GMP certification of their own facilities. This typically involves selling dry flowers under GACP certification to an importer with an EU-GMP certified facility in an EU member state where the regulator authorises such imports. In some cases, these sales are to contract manufacturers who process the flowers, but in some cases interviewees voiced concerns the intermediation involved little more than repackaging and labelling, and that intermediaries achieved high margins through this.[27] Regulatory barriers thus appear to create a form of policy rent for European importers. It also risks shutting South African producers out of more high-value product categories in the medical cannabis value chain, with participation limited to the supply of bulk-packaged dry flowers. In narrowing the range of sales channels available, it also reduces the bargaining power of South African exporters. While EU-GMP is a particular challenge, other major importers such as Israel, Australia and the UK also have complex and varying requirements.[28] The international cannabis market is an incoherent regulatory patchwork lacking standardisation associated with more mature industries. South African producers face serious difficulties navigating this, adding to both operating costs and financial risks.

MRAs for SAHPRA licences may help address these challenges. This would mean the EMA (or other countries' regulators) recognising South African SAHPRA-licensed medical cannabis as equivalent to that produced under their standards, negating the need for obtaining additional licences or reliance on an EU-GMP licensed intermediary (Hudock, 2021). SAHPRA has sought to align with international GMP standards and South Africa is a member of the Pharmaceutical Inspection Co-operation Scheme (PICS), which supports GMP harmonisation and regulatory cooperation (PIC/S, n.d.). PICS membership

There is a range of potential interventions to consider which could address regulatory challenges:

- MRAs with major export markets: this would involve further alignment to international standards. This may involve trade-offs in terms of inclusivity and ability to tailor regulations to the South African context. As discussed in Section 4, tiered licensing systems may be a means to address these trade-offs.
- A trade advisory group may help reduce the time producers spend navigating regulatory complexity. This could support relevant government agencies in negotiating improved market access and ensuring South Africa has a voice in international standardisation processes. Lessons can be learned from the fruit industry, where state-business coordination through forums such as the Fruit Industry Value Chain Roundtable's Trade Working Group has helped address market access challenges.
- Streamline domestic certification and permit issuance through increased capacity at SAHPRA. Lessons may also be learned from the fruit industry where there has been digital innovation for faster verification and certification processes (Food Business Africa, 2022).
- Expand domestic market opportunities for medical cannabis producers (medical and adult-use) to reduce export dependency and increase bargaining power.

26. Interview 20.
27. Interview 12 and 25.
28. Interview Jeff Verlinden.

Multiple interviewees raised concerns about lack of South African hemp processing capacity. Investment support for hemp processing, ideally co-located with cultivation, is required to catalyse growth in hemp farming.

reflects SAHPRAs high international reputation - South Africa is the only African PICS member, and there are only a handful in Latin America and the Caribbean. There was an expectation that PICS membership would enable MRAs for South African medical cannabis, but PICS membership does not entail automatic mutual recognition of GMP standards. Such MRAs do, however, exist for several major medical cannabis exporting countries, with producers in Australia, Israel, and Canada reportedly able to export to the EU without EU-GMP certification (Arnold, 2019; Hudock, 2021).

3.3 Short-term challenges for industrial hemp

Short-term challenges for hemp differ to those in medical cannabis. As discussed in Section 1.3, export opportunities for raw or semi-processed hemp products are limited. In the short-term at least, domestic markets will be key for hemp producers. A key immediate challenge is lack of processing capacity. Experiences in more mature markets show location close to processing facilities is important for the economic viability of hemp cultivation (Mark et al., 2020). Hemp processing is a specialised activity requiring specific equipment, and limitations in processing capacity have been a critical constraint for hemp farmers in other parts of the world (Lowitt, 2020b; Mark et al., 2020; Moore et al., 2021). Processing techniques and equipment also differ according to the end-market (UNCTAD, 2022). As a New Zealand government report states:

> "In Canada and the Netherlands, the most successful hemp businesses tend to be vertically integrated, with downstream processors actively involved with the cultivation of industrial hemp. This is because these structures provide stronger assurance of price and demand for growers. Situations such as the price crashes in the US in 2019 and Canada in 1996 and 2001 (when Canada primarily sold to the US) highlight the dangers of a disconnect between supply and demand in emerging markets. Currently, there is considerable risk to farmers who grow without first contracting with a reliable processor who will pay them for their crop. Supporting good processors and connecting them to growers is key for the whole supply chain." (Moore et al., 2021)

Multiple interviewees raised concerns about lack of South African hemp processing capacity. Investment support for hemp processing, ideally co-located with cultivation, is required to catalyse growth in hemp farming. Research by Allen et al. (2019) suggests that while South Africa has key gaps in its fibrous plant economy – of which hemp is a key component – relative to the overall level of economic complexity, there are sufficient adjacent capabilities to enable diversification into these activities. Research by Lowitt (2020b) suggests the most easily-attainable opportunities are in consumer goods such as food products, where existing manufacturers have relevant advanced capabilities, and could incorporate hemp into existing production processes. Textiles would be harder, given weaknesses in the industry after decades of declining investment and import penetration post-liberalisation, and the difficulties adapting existing machinery to hemp (ibid.). The large domestic vehicle manufacturing industry and advanced R&D underway through the Council for Scientific and Industrial Research (CSIR) means bio-composites might be a particularly important strategic opportunity (ibid.). Labat, which is seeking to become a major integrated hemp producer, has claimed that each car produced in South Africa contains 45 kg of hemp plastic products, all of which are currently imported (Labat, 2019).

Arguably a more fundamental issue than creating downstream value chain linkages is that of end-market demand. Industrial hemp has a vast range of potential applications, including as an environmental substitute for fossil fuel-based plastics, cotton and some cement-based building materials. Hemp farming can

Longer-term challenges involve supporting innovation and learning that enables South African producers to maintain competitiveness by keeping pace with the global technological frontier, and to upgrade into more high value-added activities in cannabis GVCs.

produce positive environmental externalities through carbon sequestration and phytoremediation, and may be used to generate additional income streams through carbon offset credits (UNCTAD, 2022). Phytoremediation is particularly important in South Africa given the amount of land contaminated by mining. Given these potential environmental benefits, in the long-term hemp demand may be very large. In the short-term, however, this demand is mostly hypothetical. The major demand-drivers involve relatively novel products which must compete with more established substitutes (Lowitt, 2020b).

3.4 Long-term challenges: economic, social and environmental upgrading

Longer-term challenges involve supporting innovation and learning that enables South African producers to maintain competitiveness by keeping pace with the global technological frontier (rather than lowering labour or environmental standards), and to upgrade into more high value-added activities in cannabis GVCs. In particular, the aim should be targeting activities that generate innovation rents through control of intangible assets (Kaplinsky and Morris, 2016). The risk otherwise is of a form of 'shallow' integration (Morris and Staritz, 2019) in the GVC, and being positioned in international cannabis markets as an easily replaceable supplier of undifferentiated products subject to continual downward price pressure – a commoditisation trap (Ghodsi and Stehrer, 2018). This would jeopardise jobs and investment, and create pressures on wages and working conditions. Long-term competitiveness will also depend on 'social upgrading' (Barrientos et al., 2011) to improve labour standards around the principles of decent work, and on 'environmental upgrading' (Marchi et al., 2019) to minimise the ecological footprint of cannabis production. Environmental and social upgrading processes should be understood as closely connected to economic upgrading, rather than separate concerns.

Given these challenges, in the near-term, policy support for hemp should seek to:

- Support research on the economic viability and developmental/environmental additionality of different hemp product categories to determine where state support for market development and investment in processing may be justifiable. This should also guide support for hemp cultivators, given the need for specialisation in cultivation varieties and techniques according to the end-market.
- Based upon this research, provide industrial policy incentives and development finance for investment in downstream processing capacity in the hemp supply chain.
- Where there is a compelling developmental rationale, demand-side industrial policy measures (Mazucatto, 2015; Santiago and Weiss, 2018) could accelerate the growth of end-markets for hemp products. This could include leveraging public procurement, or providing incentives or compulsions for buyers to switch to environmentally-friendly hemp-based materials – for example in the use of hempcrete, bio-composites, and biodegradable packaging.
- Extend support for R&D on hemp-related manufacturing, such as that underway at the CSIR (Burger, 2022).

The risk of commoditisation

There are already signs of commoditisation pressures building in cannabis markets, with analysts and interviewees anticipating that increased supply in the coming years will intensify competition. As Prohibition Partners (2021, 42) note, '[p]roducers should expect price reductions over the next few years, as more and more low-cost cannabis comes online from countries across the Mediterranean and Global South. In addition, an increasing number of importing countries such as Germany and Israel are growing their own cannabis.' New Frontier Data (2021, 112) states:

> ... with more countries quickly ramping up production capacity, and the comparatively slower growth of medical cannabis program participation in Europe, there will likely be an acute inventory glut for the next few years until demand grows sufficiently to meet the burgeoning supply. [This] will likely lead to sharp price declines, eroding some of the anticipated future economic returns relative to current market prices, and ceding advantages to the lowest-cost, most-efficient operators, and those markets with the most cannabis-friendly regulatory environments.

Events in the Canadian cannabis industry are instructive, with boom/bust dynamics following an initial rush of investment that generated oversupply, falling prices, and reduced profitability (Bewley-Taylor et al., 2020; Prohibition Partners, 2021). Without forms of economic upgrading that generate production efficiencies through application of better technology, or which enable shifts into higher-value products, these commoditisation pressures risk putting downward pressure on wages, working conditions, and environmental standards to maintain price competitiveness.

Small candies made with cannabis on sale.
(Photo: ZUMA Press, Inc. / Alamy Stock Photo)

South Africa faces classic 'latecomer' challenges in achieving competitiveness in the global cannabis industry given the head-start of European, Israeli and North American firms.

Identifying opportunities for economic upgrading

A key priority should be research to identify opportunities for economic upgrading based on linkages from South Africa's cannabis cultivation base, with this used to target industrial policy support for activities with the highest developmental benefits. The NCMP is currently lacking this kind of evidence base, and while emphasising the importance of downstream value addition, pays less attention to potential opportunities afforded by backward and horizontal linkages from cultivation, in the supply of inputs, equipment, machinery and services. Interviews suggest there may be particularly important opportunities here in high-value, innovation-intensive industrial activities. In some of these, South Africa may have important adjacent capabilities given the large horticulture sector and strong public research capacity. As discussed above, advanced cannabis cultivation is a form of precision agriculture with dense backward linkages given requirements for large amounts of advanced equipment and inputs. This can involve greenhouses, growing racks and trays, lighting installations, hydroponic or aeroponic systems, automated trimming and cutting equipment, security installations, ventilation/filtration, and digital environmental control systems. Inputs include specialised nutrients, chemical or organic pest control, growing media, and most importantly, specialised genetics and propagation material. Specialised consultancies also play an important role in supporting cultivators with design and system integration. As Prohibition Partners (2021) note, "ancillary services such as technology, professional services, extraction, distribution, packaging, and construction are becoming increasingly important" as the cannabis industry grows. Interviewees suggested most equipment and many key inputs in South African cannabis cultivation are imported, including more basic items. The major manufacturers of specialised capital goods and inputs are predominantly in North America and to a lesser extent Europe, with China reportedly a key source for more basic equipment.[29] Opportunities for localisation require further exploration.

As discussed above, cannabis genetics is likely to be a critically important activity for value capture across all forms of cannabis cultivation. In hemp, seed is typically the most important input cost. Maximising productivity requires seeds bred for specific conditions. However, hemp seed is currently imported, with considerable difficulty. In medical cannabis, dry flowers are not a generic product, and customisable varieties are centrally important to product development and differentiation.[30] Consistency requirements mean the supply of clones and tissue cultures is an important activity, and an export opportunity. Differentiation through genetics is additionally important in legal adult-use markets, where branding and customisability is more complex. Given the importance of genetics to value capture, a key concern of many interviewees was the lack of enforceable intellectual property (IP) protection available to creators of new cannabis varieties, with breeders' rights for cannabis reportedly being a legal grey area in South Africa and elsewhere in the world (Ras, 2022).[31] This leaves innovators at risk of expropriation.[32] Development of IP protection should be a priority. However, this would need to be sensitive to concerns, discussed in Section 4, about bioprospecting/biopiracy of indigenous landrace cannabis varieties.

Building a sectoral innovation system for cannabis

South Africa faces classic 'latecomer' challenges (Amsden, 2001; Malerba and Lee, 2021) in achieving competitiveness in the global cannabis industry given the head-start of European, Israeli and North American firms. These challenges are magnified given short cycle-time (Lee, 2019) for technological change as the

29. Interview 19.
30. Interviews 20, 22, 8, 9.
31. Interviews 20, 12, 15, Jeff Verlinden.
32. Interviews 20, 13, 21.

Given South Africa's strengths in adjacent industries such as pharmaceuticals and high-value horticulture, there are other existing organisations that may be able to provide support.

cannabis industry goes through rapid evolution. Successful industrial catch-up depends on the quality of the sectoral system of innovation (SSI): the organisations and institutions that support generation of improved technologies through R&D, the delivery of assistance of innovating firms, the diffusion of improved technologies and skills, and the coordination of industry actors to solve collective action problems related to the above (Malerba and Lee, 2021). As a sunrise industry, the cannabis SSI has key gaps. There are nonetheless multiple organisations in South Africa conducting R&D or innovation activities, including multiple innovation-intensive firms in the medical cannabis sector, higher education institutions such as University of the Free State, Tshwane University of Technology, and University of Pretoria, state research organisations such as the CSIR and Agricultural Research Council (ARC), and industry bodies such as Cheeba Africa, which provides SETA-accredited training for cultivators. Given South Africa's strengths in adjacent industries such as pharmaceuticals and high-value horticulture, there are other existing organisations that may be able to provide support.

Alongside building SSI capacity, a key challenge is coordination. This may require new organisations and institutions. A key concern of many interviewees was the fragmented governance of cannabis. Multiple state agencies and departments influence policy and regulation, and have not always acted coherently.[33] Issues relating to hemp, medical and adult-use cannabis often overlap, and overlaps will increase as legal markets develop. However, they are dealt with by separate agencies. Interviewees also expressed concerns about limited cannabis expertise within the state. Establishing a state agency with broad responsibility for coordinating support to, and regulation of, the cannabis industry may help address these challenges. Germany and Uruguay have established specialised agencies of this nature. The Uruguayan government, for example, founded the Instituto Nacional de Regulación y Control del Cannabis (IRCCA), (National Institute of Cannabis Control and Regulations), which regulates commercial cannabis in line with national development and human rights priorities, and supports technical innovation, inter-agency dialogue and knowledge generation (ICCRA, n.d.). In the South African context of high inequality and unemployment, such an agency should also have a developmental mandate for promoting decent work and inclusive growth through participation of small enterprise and traditional growers.

The formation of a well-resourced and representative industry association could provide valuable support in many of the areas discussed above (and below in Section 4), as they do for many other agricultural commodities. Industry associations can perform important developmental functions (Doner and Schneider, 2000; Watkins et al., 2015), including mobilising financial resources through member levies for investment in collective services such as R&D, market data, and product standards monitoring; facilitating state-business dialogue; sharing knowledge and information among members; and organising mentorship and training activities. A good example is the South African Citrus Growers Association (Chisoro-Dube and Roberts, 2021).

Embedding decent work and sustainability: supporting social and environmental upgrading

A final key area of long-term strategic importance is social and environmental upgrading: supporting high labour standards in line with ILO decent work principles, and improving environmental standards. Decent work entails a concern with the quality of employment rather than just quantity of jobs: work that is productive and with fair incomes, good working conditions, access to social protection, and workers' voice and

33. Interview 10.

Poorly regulated or irresponsible cannabis production could exacerbate challenges with water stress, electricity shortages, and reaching net-zero emissions.

agency in the workplace (Barrientos et al., 2011). This is intrinsically important to realising the developmental potential of cannabis. There are also important instrumental reasons for industry to seek higher labour and environmental standards. Cannabis cultivation has a potentially large ecological footprint given high requirements for water and energy – in particular in controlled environment production. Research in the United States shows life-cycle greenhouse gas emissions of 2,283 kg - 5,184 kg CO^2-equivalent per kilogram of dried cannabis flower (Summers et al., 2021). This compares to 15 kg for a kilogram of ground coffee (Kay, 2022). Some researchers have questioned the long-term sustainability of controlled-environment cannabis production given this energy-intensity, and advocate for outdoor production (Kay, 2022). Similar to other forms of horticulture, cannabis cultivation can use significant volumes of water. A survey in the United States shows consumption of 2.2-2.5 gallons (~11 litres) per day, per plant in greenhouse production, and double that during summer in outdoor production (Madhusoodanan, 2019; Wilson et al., 2019). There are also potential issues with pollution from fertilisers, pesticides, packaging, and other waste materials.

Poorly regulated or irresponsible cannabis production could exacerbate challenges with water stress, electricity shortages, and reaching net-zero emissions. Long-running problems with working conditions and casualisation in much of South Africa's horticulture and viticulture industries (Alford et al., 2017; Barrientos and Visser, 2013; Bek et al., 2012; Ewert, 2012) are instructive regarding the importance of embedding decent work in cannabis. These problems have caused significant episodes of labour unrest, and at times created difficulties with the international reputation of South African produce. Consumers are increasingly attentive to ethical and environmental supply chain conditions, and reputations tainted by scandals about working conditions or environmental damage can jeopardise access to major buyers and markets. Multiple interviewees took the view that cannabis consumers would be concerned with such issues, and believed there would be price premiums available for cultivators able to demonstrate high environmental and labour standards. Ethical and sustainability certification schemes are already a major feature of globally-traded, high-value agri-food consumer goods such as wine, coffee and chocolate, and this is expected to become a feature of cannabis markets in future. These trends are already apparent in North America (Bennett, 2021; Bryant, 2020; Kay et al., 2020). It is concerning that the most recent iteration of NCMP is silent on these issues.

Several firms interviewed were seeking to proactively address these issues through innovative renewable energy, water management, and organic pest control systems, and stressed a desire to avoid labour relations challenges seen elsewhere in South African agriculture. However, addressing these issues should not be left to individual voluntary initiatives. Maintenance of high ethical and sustainability standards is a collective action problem, since irresponsible behaviour by a minority can tarnish the industry as a whole. It therefore requires collective initiatives, including participation by organised labour and community groups. An initial step could include development of a multi-stakeholder industry charter for labour and sustainability standards in cannabis, with an accompanying certification scheme. Such an initiative may learn from, or align with, similar existing initiatives, for example the Sustainability Initiative of South Africa (SIZA), which was developed by the fruit industry to demonstrate compliance with labour and environmental standards to international retailers (SIZA, n.d.). The cannabis licensing system provides additional leverage for coordinating higher industry standards. Labour and sustainability requirements could be introduced to licence conditions in future. Finally, R&D on sustainable cannabis production models and technology should be a priority area for state support within the SSI.

4

INCLUSIVE GROWTH IN THE CANNABIS ECONOMY: ADDRESSING CHALLENGES FOR TRADITIONAL GROWERS AND SMALL ENTERPRISE

Key points

- Cannabis production plays an important role in agrarian livelihoods for some of South Africa's most marginalised rural communities. Formalisation presents potential opportunities for these communities, but also threats.
- Current regulations create high barriers to entry that will prevent traditional growers participating in formal markets for hemp and medical cannabis. Even in a more accommodating legal and regulatory framework, traditional growers will likely struggle to compete without support.
- Legal adult-use markets represent the best formal-sector opportunity for traditional growers, but legalisation would expose them to intense competitive pressures.
- Landrace cannabis varieties are potentially valuable indigenous knowledge assets, but are at risk from bioprospecting and contamination.
- A range of creative regulatory and support measures are required to create an inclusive cannabis industry in which traditional growers prosper.
- A key step is to create a tiered licensing system, in which more accessible licences are available to traditional growers and small enterprises alongside offtake agreements with downstream aggregation agents who provide a route to market and a means of ensuring products meet commercial standards.
- Traditional growers will require extensive financial and technical support to develop capabilities required to compete in formal markets.
- There are areas of potential specialisation in Fair Trade business models and commercial exploitation of landrace varieties, which require further investigation. Safeguarding the intellectual property of landrace varieties is an urgent task.
- Regulatory interventions may help create demand for produce from traditional growers by incentivising or compelling procurement from them.

A key policy challenge is generating formal sector opportunities for traditional growers that have historically supplied illegal markets, and have been victims of persecution and marginalisation resulting from prohibition. The needs of such stakeholders are quite different from those of formal-sector agribusinesses discussed in Section 3. As this section discusses, legalisation also poses

potential threats to traditional grower livelihoods if it is not carefully managed. Ensuring a 'just transition' to a legal cannabis economy will require regulatory innovation combined with extensive support for inclusive business models and building the capabilities of traditional growers to meet formal standards.

4.1 Traditional growers in the illegal cannabis economy

There is limited data and research available on the characteristics of the illegal cannabis industry. Research on this topic is essential to better understand how to achieve a 'just transition' to legalisation. The NCMP states that 900,000 people are engaged in cannabis production, and this figure circulates widely. This research was unable to find the source for this claim, and it is unclear whether this refers to people wholly or partially dependent on cannabis for their livelihood, or whether it includes those growing for personal consumption. Nonetheless, estimates of domestic adult-use demand (Section 2.1) show the illegal cannabis industry is large. Decades of sociological research has shown cannabis to be an important crop in marginalised rural areas that are harder for authorities to access, and in which alternative livelihood options are limited (Fortune, 2021; Kepe, 2007, 2003; Manu et al., 2021; Grooten, 2022). This includes rural areas in the Eastern Cape, KZN and Limpopo, with the Eastern Cape's Pondoland region frequently identified as a major source of cannabis for illegal markets. Besides supplying illegal markets, traditional growers have cultivated cannabis for centuries as traditional medicine. Interviewees and existing research suggests cannabis plays an important role supporting livelihoods, with some communities heavily reliant on the crop (Fortune, 2021;

Close-up of a joint in a field of cannabis plants in the background.
(Photo: Forray Didier/sagaphoto.com / Alamy Stock Photo)

Cannabis has several attractive features for smaller producers. Unlike conventional field crops, it has a high value to weight/volume ratio.

Manu et al., 2021; Grooten, 2022).[34] Cannabis has several attractive features for smaller producers. Unlike conventional field crops, it has a high value to weight/volume ratio, and unlike many valuable horticulture crops it has short production lead times, with harvests in the first season after planting, and it is relatively easy to store and transport given perishability (Lewis, 2020). Nonetheless, research suggests illegal cannabis production is generally a precarious livelihood. Though there is considerable differentiation among illegal cannabis producers (Clarke and Riboulet-Zemouni, 2021; Fortune, 2021; Kepe, 2003), in general traditional growers are from low-income communities, operating at relatively small scale, with low levels of capital invested in operations (Manu et al., 2021). A 30 litre bucket of cannabis reportedly sells at wholesale for between R400-R600 – to contextualise this, legal medical cannabis is sold wholesale for US$2-5 (~R30-R90) per gram. Furthermore, traditional growers typically operate in areas with poor road, electricity and water infrastructure, due to historic neglect. This will be a major competitive disadvantage in formal markets.

Traditional growers frequently use landrace cannabis varieties that have adapted to local conditions. Landrace varieties typically have lower THC content, in the region of 5%-10% according to interviewees. Interviewees suggested some illegal growers use imported hybrid varieties since higher THC levels have become increasingly important in illegal adult-use markets. Landrace varieties are nonetheless a key indigenous knowledge asset, with significant potential commercial value given the importance of new genetic material to the global medical and adult-use cannabis industry (Section 3) (Duvall, 2019). Indeed, landrace strains have already provided the genetic foundations for famous international varieties such as Durban Poison. Though lower in THC, they may be higher in other cannabinoids, terpenes or flavonoids, or have unique combinations thereof with therapeutic value given the entourage effect. Management of landrace varieties for the maximum benefit of traditional grower communities is a key policy challenge, discussed further below.

Finally, it is important to recognise that traditional growers have been on the receiving end of decades of state persecution (Kepe, 2003). Alongside arrests and prosecutions, this has included, as recently as 2016, spraying crops with glyphosate, a potentially carcinogenic herbicide.[35] While crop-spraying has been halted in recent years, secondary literature and interviews suggest traditional growers continue to live in fear and precarity due to the threat of arrest (Manu et al., 2021). Additionally, supplying illegal markets creates the risk of appropriation by organised criminal groups involved in downstream value chain activities. Creating formal-sector opportunities for traditional growers is important as a means of redress.

4.2 Challenges for inclusive growth in formal cannabis markets

While legalisation is frequently presented as an opportunity for traditional growers, there are multiple obstacles to their participation in the formal hemp and medical cannabis industry, and adult-use legalisation represents a potential threat to livelihoods. Current licensing requirements for hemp and medical cannabis will largely exclude traditional growers – and indeed under-capitalised small enterprises in general – from participation in these value chains (see Section 2). Even if domestic regulatory barriers were lowered, traditional growers would face severe competitive challenges in medical and industrial cannabis. Medical cannabis has high quality and consistency standards that are demanding even for large-scale agribusiness with experience in export horticulture (see Section 3). Supplying medical cannabis for extractions may be somewhat less demanding, but would still require meeting high quality, safety, and yield standards, and would likely involve intense price competition with large-scale producers. Hemp appears in some key respects more accessible

34. Interview Ricky Stone, Ras Prince, Myrtle Clark.
35. Interview Ricky Stone.

Legalisation would likely trigger a flood of investment into the industry, and firms producing at scale for medical export markets would rapidly enter the market.

given the lower complexity and outdoor production system. Trials have suggested it is viable at small-scale. However, hemp is supplied as an intermediate input for industrial processes, giving growers little opportunity for product differentiation or pricing power, and favouring large, low-cost producers. Challenges faced by hemp farmers in more mature markets are important to consider (Section 1.3). So too are the major challenges faced by small-scale farmers across most crops in South Africa, with the agrarian economy remaining highly dualistic. Traditional growers would likely require multiple forms of support and a different licensing system to participate in these value chains (discussed in 4.3 below). Traditional growers would also not be able to use their landrace cannabis varieties under current regulatory arrangements, and these would be at risk from contamination from commercial hemp varieties (discussed further below).

Commercial adult-use markets appear to offer the best formal sector opportunities for traditional growers, dependent on regulation. While future adult-use regulation is uncertain, it can reasonably be expected that standards would be less demanding than in medical cannabis. For example, lesser requirements for traceability and GMP-level hygiene standards, and instead more basic safety and hygiene standards similar to those used in the food and beverage industry. As discussed in Sections 1.1 and 2.1, adult-use markets are also highly segmented, with opportunities for niche products and shorter value chains where cultivators can sell near finished goods. There may be opportunities for less capital-intensive business models, involving artisanal outdoor production. Correspondingly, there might also be opportunities for marketing based on provenance, Fair Trade-style business models in which consumers pay a premium to support communities, or the uniqueness of the landrace strains and their terroir. These opportunities add to the urgency of reforms to create a regulated adult-use market.

Nonetheless, while the most hypothetically accessible opportunities appear to be in legal adult-use markets, there would also be significant competitive pressures. Research by Manu et al. (2021, 6) found that 'while the assumption is often that illegal marijuana growers and traders would welcome legalisation and regularisation of their trade, participants were wary of such an idea as they saw it as a threat to their livelihood' (see also Grooten, 2022). Traditional growers have been competitive in illegal adult-use markets principally because of artificial scarcity created by prohibition (Fortune, 2021; Kepe, 2003; Lewis, 2020). Manu et al. (2021) find that 'desperate' middlemen travel to remote rural communities for cannabis due to lack of other opportunities. Legalisation would likely trigger a flood of investment into the industry, and firms producing at scale for medical export markets would rapidly enter the market. Interviewees and existing research suggests decriminalisation of private-use cannabis has already impacted traditional growers, with prices plummeting as demand decreases (Clark, 2019). Further price decreases could be expected with legalisation (Birguid, 2021; Fortune, 2021). In North America, there are concerns about consolidation and competitive pressures squeezing out small producers. Regulation would be required to counteract this. As discussed in 1.1, adult-use cannabis regulation is a complex balancing act: regulation that is too permissive may jeopardise public health, but regulation which is too strict risks perpetuating illegal markets and excluding small producers from the formal sector.

A final important challenge is protecting landrace varieties, as valuable indigenous knowledge assets. Firstly, this is from the threat of expropriation by firms in the cannabis and biomedicine industries seeking to capture new genetic material – sometimes referred to as bioprospecting or biopiracy. This is a significant threat (Duvall, 2016; Kay et al., 2020; Mjbiz, 2019; Singh, 2022). Cannabis genetics have been under-researched due to prohibition, but many firms are now conducting research, and patenting activity in cannabis has seen significant increases in recent years (Wyse and Luria, 2021). These expropriation risks are illustrated by

The transition to a formal cannabis economy will not be straightforward for traditional growers. It poses multiple challenges and if handled poorly could severely undermine rural livelihoods and exclude those who have suffered the most from prohibition from the benefits of legalisation.

Durban Poison, derived from a South African landrace variety and now used as a key 'heirloom' strain for multiple high-value branded cannabis varieties. A second threat to landrace varieties is from cross contamination with other cannabis varieties (Kay et al., 2020). For example, if outdoor hemp production takes place adjacent to landrace cannabis cultivation.

4.3 Interventions to support traditional growers

The transition to a formal cannabis economy will not be straightforward for traditional growers. It poses multiple challenges and if handled poorly could severely undermine rural livelihoods and exclude those who have suffered the most from prohibition from the benefits of legalisation. Drawing from interviews, analysis of existing proposals, and experience in other commodities, there is therefore a need for carefully targeted support measures.

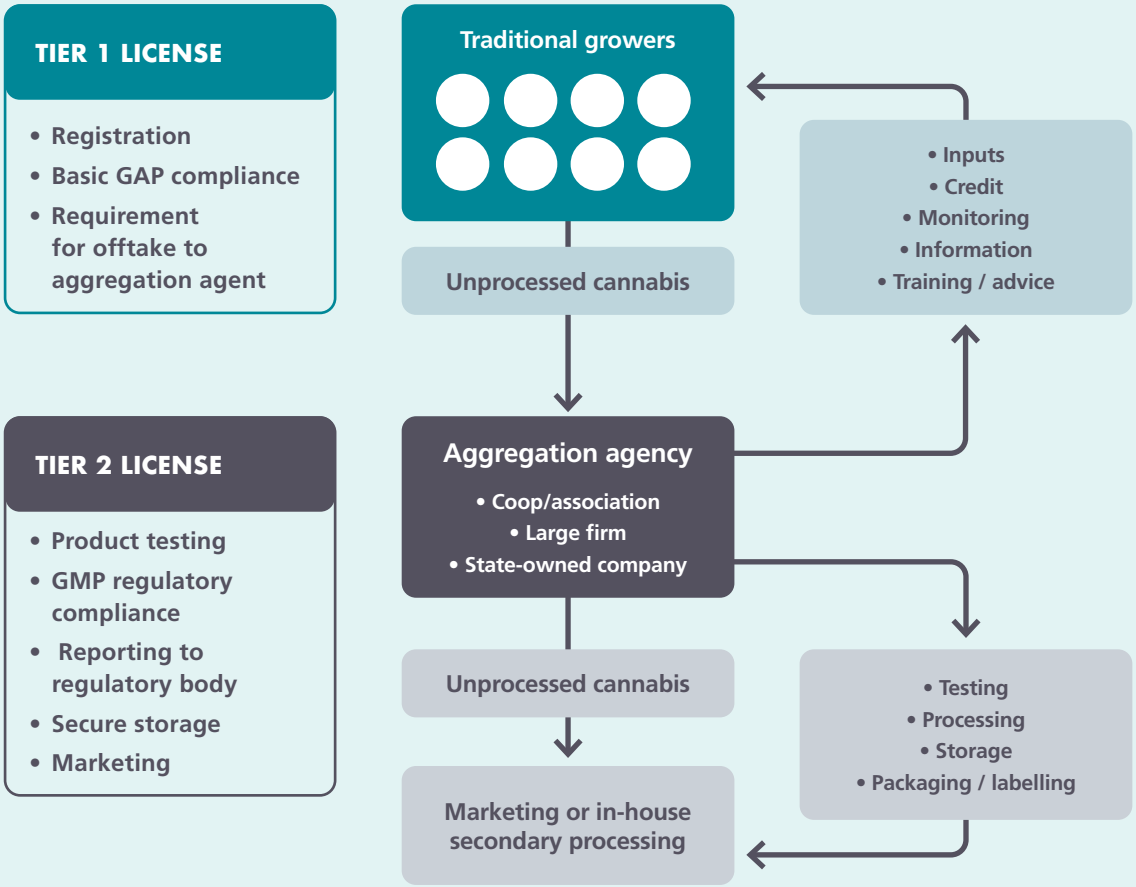
Tiered licensing systems with offtake arrangements for traditional growers

Licensing requirements for medical cannabis and hemp exclude traditional growers and small enterprises, and even a relatively light-touch approach to adult-use market regulation, with minimal requirements for product safety, hygiene, traceability, labour standards etc., may pose initial challenges for traditional growers used to operating in the informal sector. High regulatory standards are nonetheless important on public health grounds, and in the case of medical cannabis to support export market access. There is a potential trade-off between higher standards and inclusivity. A tiered licensing system is a potential path through this trade-off. This would involve replacing the existing system with its single cultivation licence with a multiple licence system. Licences with lower compliance costs for qualifying small-enterprises/traditional growers could then enable participation. These lower-tier licences may involve, for example, reduced application fees, lower security requirements, simpler record keeping and traceability measures, and more basic GAP requirements to ensure minimum safety standards. The NCMP does not address this critical issue of licensing systems. There are international examples of tiered licensing arrangements that could be drawn upon. For example, the Jamaican Cannabis Licensing Authority has sought to lower entry barriers for small producers with a tiered system (Lamers, 2020). In the United States, multiple state governments have introduced social equity licensing programmes – combined with subsidies, technical support, mentorship, and incubator programmes – to diversify the cannabis industry and support participation by disadvantaged groups (Kilmer et al., 2021). The Californian cannabis licensing system includes Speciality-Cottage, Small and Outdoor licences. Similar principles are also applied in the South African liquor industry, with the provision of 'micro-manufacturer' licences in the Liquor Act (2003).

Given public health and biosecurity concerns, a condition could be offtakes with a downstream aggregation agency operating under a higher licence, that would be responsible for more stringent testing, quality control, hygiene, and record keeping/reporting, and remaining activities required to get the product to market (processing, packaging, storage, marketing, etc.). They could also play an important role supervising cultivators to improve standards and access to inputs, training, and equipment. Aggregation agencies could be a cooperative, state-owned enterprise, or a separate commercial enterprise. The model is illustrated in Figure 8 below.

FIGURE 8

Tiered licensing system to support traditional growers from the benefits of legalisation



Some interviewees and licensed commercial cannabis producers have expressed interest in providing a route to market for emerging cannabis producers. However, the challenges involved with an aggregator role for traditional growers would likely require significant subsidisation, either to fund establishment of cooperatives or incentivise commercial operations. Analogous proposals for 'Cannabis Hubs' are outlined in detail by the NGO Fields of Green for All (Clarke and Riboulet-Zemouni, 2021). The NCMP also proposes a related system of primary and secondary cooperatives.

Related models for enabling smallholder integration into formal supply chains are ubiquitous in agricultural development, ranging from farmer cooperatives that engage in processing or marketing, to 'contract farming' or 'out-grower' models, to more recent supplier development programmes initiated by large firms. Within South Africa, the wool industry in communal areas of the Eastern Cape provides a potentially useful example. Here, small-scale wool producers on communal land have significantly increased their output over the past decade, with many farmers now producing high-quality merino wool for export markets. Public-private partnerships involving government and the National Wool Growers Association organised communal wool farmers into localised associations, centred around a collective shearing shed, with the NWGA and brokerage firms reaching farmers through the associations and the sheds where wool is collected, sorted and graded before marketing (De Beer and Terblanché, 2015). Numerous large food retailers and manufacturers now run supplier-development programmes to integrate small producers into their supply chains

Supporting specialisation in niche product areas may be a useful means to support more resilient livelihoods for traditional growers, and lower competitive pressures.

and provide assistance for upgrading (das Nair and Landani, 2021). The challenges to implementing such models in cannabis may be greater given the more complex public health and legal issues. It is also important to recognise concerns about 'inclusive' supply chain models and contract farming systems for small farmers, which typically involve large power imbalances between large buyers and small suppliers. Critics have pointed to instances in which such arrangements fail to produce desired results due to insufficient commitment from buyers or inequitable distributions of costs and benefits among participants (Guarin et al., 2022; Niño and Oya, 2021). Such arrangements would therefore require regulation to guard against exploitation of traditional growers by more powerful downstream actors.

Building capabilities

Lowering regulatory barriers is necessary but not sufficient. Traditional grower participation will require support to rapidly build capabilities required to compete in formal markets. This will include state agricultural extension services alongside improved access to finance from development finance institutions and micro-lending agencies. Cooperatives or farmer associations could also play an important support role, but would require funding and technical assistance. Given the novelty of cannabis production and lack of state expertise on the crop, mentorship/incubator arrangements and opportunities for knowledge exchange with more established firms and industry experts in the private sector are particularly important. A representative industry association of the kind discussed in Section 3.4 could play an important role in this. In many established agricultural commodity associations, the state grants an ability to collect compulsory levies to the trade association to mobilise funds, on the condition 20% is devoted to emerging farmer development. Similar arrangements could be considered for cannabis. A final issue is infrastructure. Traditional growers typically operate in remote rural areas lacking adequate basic infrastructure. Addressing this will also be essential to participate effectively in formal markets.

Developing opportunities for specialisation

Supporting specialisation in niche product areas may be a useful means to support more resilient livelihoods for traditional growers, and lower competitive pressures. As discussed in Section 3.4, ethically and sustainably produced cannabis is likely to be an increasing feature of cannabis markets. Some cannabis policy experts have suggested Fair Trade business models as a way to improve the position of small growers in the global cannabis industry, and there are detailed proposals for how this could work (Bewley-Taylor et al., 2020; Kay et al., 2020). Ethical certification schemes potentially give producers additional pricing power and access to high-end niche consumer markets (Clarke and Riboulet-Zemouni, 2021; Kay et al., 2020; Rolles and Slade, 2022). As proponents note, these schemes are complex to operate, gaining certification can be time consuming and costly, and there have been past challenges with other Fair Trade goods concerning the extent to which these arrangements maximise benefits for producers (rather than distributors/retailers). Research into the viability of such models and certification schemes in a South African context should be a key priority.

Another potential area for specialisation for traditional grower communities is in equitable commercial exploitation of landrace cannabis varieties. These varieties may have valuable, unrealised medical properties. They may also have value in adult-use markets. As these become increasingly sophisticated and less THC-oriented, there may be demand for unique, indigenous cannabis varieties as an alternative to

high-THC commercial varieties. This would provide opportunities for branding and marketing based on provenance and terroir. It is important to quickly develop safeguards for these indigenous knowledge assets against the threat of expropriation and contamination (Clarke and Riboulet-Zemouni, 2021; Kay et al., 2020).

Support demand for traditional grower produce

Initiatives to increase the volume and quality of supply from traditional growers could be complemented by initiatives to support demand through interventions in cannabis markets. This could involve measures to incentivise or compel large-scale processing firms in the hemp or medical cannabis industry to procure from traditional growers, for example as part of an industry charter for inclusive and sustainable development (Section 4.4), or as a future licensing conditionality. In Columbia, for example, the regulatory system requires processors to source 10% of their cannabis from small- and medium-scale cultivators (Kay et al., 2020; Ministry of Health and Social Protection, 2017). In future legal adult-use cannabis markets, licensed dispensaries could be incentivised or required to stock produce from traditional growers. Use of differential minimum pricing or taxation policies are likely to be an important element of regulation of legal adult-use markets for public health purposes (Rolles and Slade, 2022). Consideration could also be given to tailoring differential pricing/taxation mechanisms to support demand for produce from traditional growers. Some state jurisdictions in the United States cap the number of licences and reserve a portion of them for social equity licence holders in order to mitigate the risk of oversupply (The Economist, 2022). More radically, some propose using a state marketing board as a means of supporting and stabilising prices (Manu et al., 2021). All such options would require significant further research as to how such measures would affect investment and employment.

Proposals from advocacy organisations and policy experts include:

- Supporting initiatives to catalogue landrace varieties and develop seed banks.
- Supporting benefit-sharing research into the medical properties of landrace varieties.
- Obtaining intellectual property protections under indigenous knowledge systems protection laws, domestically and internationally. For example, in South Africa some protection may be afforded by the Protection, Promotion, Development and Management of Indigenous Knowledge Systems Act, and the National Indigenous Systems Knowledge Office. Internationally, the Nagoya Protocol on fair and equitable benefit sharing from the use of genetic resources may provide protection and means to ensure traditional grower communities benefit from any future commercialisation of landrace varieties.
- Registration of Geographical Indications (GIs) for landrace varieties and associated place names. GIs protect intellectual property rights for products with a specific geographical origin and with qualities and/or a reputation relating to a place of origin. They can prevent third parties using names associated with traditional grower communities and their products. GIs have become widely used in the food industry, with Rooibos protected since 2014 (WIPO, n.d.).
- Benefit-sharing models to ensure just distributions of future economic gains derived from landrace varieties. Lessons may again be learned here from the successes and shortcomings of such arrangements in the Rooibos industry, which has been a pioneer in this field (Biénabe and Marie-Vivien, 2017; Ives et al., 2020; Wynberg, 2017).
- Zoning regulations for different forms of cannabis production to minimise the risks of cross-contamination.

(Clarke and Riboulet-Zemouni, 2021; Kay et al., 2020; Rolles and Slade, 2022)

The developmental potential of cannabis – alongside access to key export market opportunities – will require embedding principles of decent work.

CONCLUSION

There are high expectations for the contribution that a legal cannabis industry can make to inclusive economic development in South Africa. However, as this report has demonstrated, there are many challenges to overcome in order to achieve this. The emerging formal cannabis industry faces multiple obstacles to growth. There is significant latent and potential demand in domestic markets, but this is held back by continued prohibition of adult-use cannabis and restrictive regulation of medical cannabis and hemp. Accessing medical cannabis export markets requires producers to navigate a complex regulatory system – domestically and internationally – that disadvantages South African firms. Achieving growth in the legal cannabis industry that is inclusive of traditional growers, ecologically sustainable, and generative of decent work, requires addressing an additional set of challenges: current policy and regulation either neglects these issues, or has exclusionary effects. Alongside outlining key challenges, the report has sought to identify potential policy measures to address them, in the context of the NCMP process.

The creation of a legal, regulated adult-use cannabis market offers the most accessible opportunities for traditional growers and small enterprises alongside a number of other benefits. Regulation would need to ensure commercial, equity, and public health imperatives are balanced. The current systems for regulating hemp and medical cannabis are dysfunctional, placing severe constraints on the growth of the formal cannabis industry and limiting its inclusivity by creating high barriers to entry. The report identifies a number of critical issues that need to be addressed, but a more fundamental rethink of approaches to licensing – both for current hemp and medical systems, and future adult-use markets – is required to enable participation of traditional growers and small enterprises. Tiered licensing systems with social equity provisions need to be pursued to widen participation. These need to be combined with other support measures that assist traditional growers and small enterprises, including formation of cooperatives or out-grower arrangements with larger firms downstream in the supply chain and protection of landrace cannabis varieties.

Industrial-scale medical cannabis producers face immediate problems with export market access, resulting from both domestic and international regulatory challenges. A fundamentally important issue is the lack of international regulatory standardisation and lack of mutual recognition of SAHPRA licences in major export markets. The hemp industry faces key short-term problems relating to processing capacity and end-market demand. There are a range of measures required to address these. In the longer term, avoiding the risk of commoditisation and shallow forms of integration into global value chains will require support for innovation that enables upgrading into higher value activities in the chain. This is not simply a matter of funding but of creating new institutions that help coordination, mobilisation of resources, and building expertise. A state cannabis agency and an industry association should be key considerations. Finally, realising the developmental potential of cannabis – alongside access to key export market opportunities – will require embedding principles of decent work. This could be achieved through multi-stakeholder development of an industry charter for minimum labour and environmental standards, implemented through certification schemes or licence conditions.

BIBLIOGRAPHY

Adhikary, D., Kulkarni, M., El-Mezawy, A., Mobini, S., Elhiti, M., Gjuric, R., Ray, A., Polowick, P., Slaski, J.J., Jones, M.P. and Bhowmik, P., 2021. Medical Cannabis and Industrial Hemp Tissue Culture: Present Status and Future Potential. *Frontiers in Plant Science,* 12.

Alford, M., Barrientos, S. and Visser, M., 2017. Multi-scalar Labour Agency in Global Production Networks: Contestation and Crisis in the South African Fruit Sector. *Development Change,* 48: 721–745. https://doi.org/10.1111/dech.12317

Allen, C., Bhorat, H., Hill, R., Rooney, C. and Steenkamp, F., 2019. Building Economic Complexity in the South African Fibrous Plant Economy. DPRU, University of Cape Town, Cape Town.

Amsden, A., 2001. The Rise of "The Rest": Challenges to the West From Late-Industrializing Economies. https://doi.org/10.1093/0195139690.001.0001

Anum Laate, E., 2019. Production Costs and Returns of Industrial Hemp Seed in Alberta, 2017-2018. Alberta Agriculture and Forestry, Government of Alberta.

Arehart, J.H., Nelson, W.S. and Srubar, W.V., 2020. On the theoretical carbon storage and carbon sequestration potential of hempcrete. *Journal of Cleaner Production,* 266: 121846. https://doi.org/10.1016/j.jclepro.2020.121846

Arnold, M., 2019. Why International Trade Agreements Are Shaping The Cannabis Industry. *Cannabis Industry Journal*. https://cannabisindustryjournal.com/tag/mutual-recognition-agreement/

Barrientos, S., Mayer, F., Pickles, J. and Posthuma, A., 2011. Decent work in global production networks: Framing the policy debate. *International Labour Review,* 150: 297–317. https://doi.org/10.1111/j.1564-913X.2011.00118.x

Barrientos, S. and Visser, M., 2013. South African Horticulture: Opportunities and Challenges for Economic and Social Upgrading in Value Chains. https://doi.org/10.2139/ssrn.2209718

Bek, D., McEwan, C. and Binns, T., 2012. The South African Wine Industry: Meeting the Challenges of Structural and Ethical Transformation, in: P.H. Dougherty(ed.), *The Geography of Wine: Regions, Terroir and Techniques*, pp. 137–157. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-007-0464-0_8

Bennett, E.A., 2021. Consumer Activism, Sustainable Supply Chains, and the Cannabis Market. In D. Corva and J. Meisel (eds), The Routledge Handbook of Post-Prohibition Cannabis Research. Routledge.

Bewley-Taylor, D., Blickman, T. and Jelsma, M., 2014. *T*he Rise and Decline of Cannabis Prohibition: the History of cannabis in the UN drug control system and options for reform. Transnational Institute, Amsterdam. https://www.tni.org/files/download/rise_and_decline_ch4.pdf

Bewley-Taylor, D., Jelsma, M. and Kay, S., 2020. Cannabis Regulation and Development: Fair(er) Trade Options for Emerging Legal Markets, in: Drug Policies and Development: Conflict and Coexistence. Brill, Leiden.

Biénabe, E. and Marie-Vivien, D., 2017. Institutionalizing Geographical Indications in Southern Countries: Lessons Learned from Basmati and Rooibos. *World Development*, 98: 58–67. https://doi.org/10.1016/j.worlddev.2015.04.004

Birguid, 2021. Southern African cannabis industry review: executive summary. Birguid.

Bodwitch, H., Polson, M., Biber, E., Hickey, G.M. and Butsic, V., 2021. Why comply? Farmer motivations and barriers in cannabis agriculture. *Journal of Rural Studies*, 86: 155–170. https://doi.org/10.1016/j.jrurstud.2021.05.006

Bryant, J., 2020. Higher Ground: Best Practices for Safe and Sustainable Cannabis Consumption. *Sierra*. 29 December. https://www.sierraclub.org/sierra/2021-1-january-february/taste-test/higher-ground-best-practices-for-safe-and-sustainable

Burger, S., 2022. Labat, CSIR sign MoU to accelerate industrial cannabis processing. *Engineering News*. 1 April. https://www.engineeringnews.co.za/article/labat-csir-sign-mou-to-accelerate-industrial-cannabis-processing-2022-04-01

Buxton, J., 2020. Drug Control and Development: A Blind Spot. Leiden: Brill. https://doi.org/10.1163/9789004440494_003

Cantrill, A., 2022. Germany to Allow Purchase of 20 Grams of Cannabis, report says. Bloomberg.com. https://www.bloomberg.com/news/articles/2022-10-19/germany-to-allow-purchase-of-20-grams-of-cannabis-report-says?leadSource=uverify%20wall.

CarbonCredits.com, 2022. Hemp Carbon Credits. Carbon Credits, 16 August. https://carboncredits.com/hemp-carbon-credits/ (accessed 27 November 2022).

Carlini, B.H., Harwick, R. and Garrett, S., 2020. Anytime is the Right Time: A Content Analysis of Marijuana Ads in Freely Distributed Print Media in Western Washington State, USA. Substance Use and Misuse, 55: 806–817. https://doi.org/10.1080/10826084.2019.1703749

Cash, M.C., Cunnane, K., Fan, C., Romero-Sandoval, E.A., 2020. Mapping cannabis potency in medical and recreational programs in the United States. *PLoS ONE,* 15, e0230167. https://doi.org/10.1371/journal.pone.0230167

Cheeba Africa, 2022. Academy National Certificate in Plant Production Cannabis and Hemp. https://cheebaafrica.com/pages/academy-national-certificate-in-plant-production-cannabis-and-hemp (accessed 28 November 2022).

Chisoro-Dube, S. and Roberts, S., 2021. Innovation and inclusion in South Africa's citrus industry (IIAP Working Paper).

Clark, C., 2019. Legalisation is killing our market, say small-scale dagga growers. GroundUp News. https://www.groundup.org.za/article/small-scale-cannabis-growers-say-legalisation-killing-demand/ (accessed 28 November 2022).

Clarke, M. and Riboulet-Zemouni, K., 2021. Cannabis in South Africa: The People's Plant. A Full Spectrum Manifesto for Policy Reform.

Coleman, A., 2022. Government urged to intervene in SA's 'biggest-ever wool crisis.' *Farmers Weekly*, 3 August. https://www.farmersweekly.co.za/agri-news/south-africa/government-urged-to-intervene-in-sas-biggest-ever-wool-crisis/

Cramer, C., Di John, J. and Sender, J., 2022. Classification and Roundabout Production in High-value Agriculture: A Fresh Approach to Industrialization. *Development Change*, 53: 495–524. https://doi.org/10.1111/dech.12708

Cramer, C., Sender, J. and Oqubay, A., 2020. African Economic Development: Evidence, Theory, Policy. Oxford: Oxford University Press.

DALRRD, 2021a. Minister Thoko Didiza on opening of application process for HEMP permits. (Media statement, 29 October). Tshwane: Department of Agriculture, Land Reform and Rural Development.https://www.gov.za/speeches/minister-didiza-announces-opening-application-process-hemp-permits-29-oct-2021-0000 (accessed 28 November 2022).

DALRRD, 2021b. Guidelines For Hemp (Low THC Cannabis) For Cultivation For Agricultural And Industrial Purposes, Guidelines for Hemp (002).pdf Department of Agriculture, Land Reform and Rural Development. https://www.dalrrd.gov.za/doaDev/sideMenu/plantProduction/doc/HP-GD-001

DALRRD, 2021c. National Cannabis Masterplan, V5. Tshwane: Department of Agriculture, Land Reform and Rural Development.

das Nair, R. and Landani, N., 2021. New approaches to supermarket supplier development programmes in Southern Africa. *Development Southern Africa*, 38: 4–20. https://doi.org/10.1080/0376835X.2020.1780565

De Beer, L. and Terblanché, S.E., 2015. Improving the livelihoods of wool producers in a sustainable manner by optimizing the woolled sheep production systems within the communal farming area of the Eastern Cape. "A vision that is future directed." *South African Journal of Agricultural Extension*, 43: 105–122. https://doi.org/10.17159/2413-3221/2015/v43n2a382

de Lange, A., 2021. South Africa's green gold. Cliffe Dekker Hofmeyr.

Deloitte, 2016. Modelling the cost of Medicinal Cannabis. Deloitte Access Economics, Canberra.

Deloitte, 2021. An industry makes its mark - The economic and social impact of Canada's cannabis sector. Deloitte Canada.

Demko, P., 2022. Cannabis sinks amid weed glut, Congress' inaction. POLITICO.

Doner, R.F. and Schneider, B.R., 2000. Business Associations and Economic Development: Why Some Associations Contribute More Than Others. *Business & Politics*, 2: 261–288. https://doi.org/10.2202/1469-3569.1011

Duvall, C.S., 2019. A brief agricultural history of cannabis in Africa, from prehistory to canna-colony. EchoGéo. https://doi.org/10.4000/echogeo.17599

Duvall, C.S., 2016. Drug laws, bioprospecting and the agricultural heritage of Cannabis in Africa. *Space and Polity*, 20: 10–25. https://doi.org/10.1080/13562576.2016.1138674

ECA Academy, 2020. Can Cannabis be Imported into the EU without GMP Certification? https://www.gmp-compliance.org/gmp-news/can-cannabis-be-imported-into-the-eu-without-gmp-certification (accessed 28 November 2022).

EMA, 2018. Good manufacturing practice European Medicines Agency. https://www.ema.europa.eu/en/human-regulatory/research-development/compliance/good-manufacturing-practice (accessed 28 November 2022).

European Commission, n.d. Hemp. European Commission on Agriculture and Rural Development. https://agriculture.ec.europa.eu/farming/crop-productions-and-plant-based-products/hemp_en (accessed 28 November 2022).

Ewert, J.W., 2012. A force for good? Markets, cellars and labour in the South African wine industry after apartheid. Review of African Political Economy, 39: 225–242. https://doi.org/10.1080/03056244.2012.688802

Falade, E., 2022. European Market Access in the Emerging Cannabis Global Value Chain: Challenges for Emerging Suppliers (MSc Dissertation). University of Edinburgh, Edinburgh.

Food Business Africa, 2022. South Africa launches e-certification for fruits, vegetables exports. https://www.foodbusinessafrica.com/south-africa-launches-e-certification-for-fruits-vegetables-exports/ (accessed 28 November 2022).

Fortenberry, R. and Mick, T., 2014. Industrial Hemp: Opportunities and Challenges for Washington. School of Economic Sciences: Washington State University.

Fortune, K., 2021. A pot of gold at the end of the rainbow: Subsistence cannabis cultivation in the changing legislative context in South Africa (Mphil). University of Cape Town.

Gereffi, G., Humphrey, J. and Sturgeon, T., 2005. The governance of global value chains. *Review of International Political Economy* 12: 78–104. https://doi.org/10.1080/09692290500049805

Ghodsi, M. and Stehrer, R., 2018. Avoiding and escaping the 'commodity trap' in development. UNIDO Inclusive and Sustainable Industrial Development Working Paper Series.WP 9, 56.

GI-TOC, 2022. Country report: South Africa (Global Organised Crime Index). Global Initiative Against Transnational Organised Crime.

Gobbi (ed), M.S.D., 2022. Exploring decent work in the pharmaceutical industry: Job creation in the production of medical cannabis in Lesotho and Zimbabwe.

Goodman, S., Wadsworth, E. and Hammond, D., 2022. Reasons for Purchasing Cannabis From Illegal Sources in Legal Markets: Findings Among Cannabis Consumers in Canada and U.S. States, 2019–2020. *Journal of Studies on Alcohol and Drugs*, 83: 392–401. https://doi.org/10.15288/jsad.2022.83.392

Government of Canada, n.d. Authorized cannabis retailers in the provinces and territories. https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/laws-regulations/provinces-territories.html (accessed 27 November 2022).

Grand View Research, 2022. Global Cannabidiol Market Size, Share, Industry Analysis, 2030. Grand View Research.

Grand View Research, 2020. Industrial Hemp Market Size & Share Report, 2022-2030. https://www.grandviewresearch.com/industry-analysis/industrial-hemp-market (accessed 27 November 2022).

Graphical Research, G., 2021. Europe Cannabidiol Market Size 2021-2027 | Growth Outlook. https://www.graphicalresearch.com/industry-insights/1823/europe-cannabidiol-cbd-market (accessed 27 November 2022).

Groenewald, C. and Essack, Z., 2019. "I started that day and continued for 2 years": A case report on adolescent 'whoonga' addiction. *Journal of Substance Use*, 24: 578–580. https://doi.org/10.1080/14659891.2019.1642408

Grooten, T., 2022. Inclusion Of South African Cannabis Smallholders Remains a Challenge. Fields of Green for ALL. https://fieldsofgreenforall.org.za/inclusion-of-south-african-cannabis-stakeholders-remains-a-challenge/ (accessed 28 November 2022).

Guarin, A., Nicolini, G., Vorley, B., Blackmore, E. and Kelly, L., 2022. Taking stock of smallholder inclusion in modern value chains: Ambitions, reality and signs of change (Working Paper, September 2022). International Institute for Environment & Development, London.

Haines-Saah, R.J. and Fischer, B., 2021. Youth Cannabis use and Legalization in Canada – Reconsidering the Fears, Myths and Facts Three Years In. Journal of the Canadian Academy of Child and Adolescent Psychiatry, 30: 191–196.

Halley, J., 2020. 3 Big Pharma Stocks With Surprising Cannabis Connections. https://www.nasdaq.com/articles/3-big-pharma-stocks-with-surprising-cannabis-connections-2020-08-08 (accessed 27 November 2022).

Hickey, S., Sen, K. and Bukenya, B. (Eds.), 2015. The politics of inclusive development: interrogating the evidence, First edition. ed. Oxford University Press, Oxford.

Highlands Investments, 2021. Goodleaf To Merge With Highlands Investments - Cannabis Cultivation.. Highlands Investment. https://highlands-investments.com/2021/06/03/goodleaf-to-merge-with-highlands-investments-formerly-canopy-growth-africa/ (accessed 28 November 2022).

Hudock, C., 2021. EU's GMP Standard Guiding the Cannabis Industry Toward Global Legitimacy. New Frontier Data. URL https://newfrontierdata.com/cannabis-insights/eus-gmp-standard-guiding-the-cannabis-industry-toward-global-legitimacy-2/ (accessed 28 November 2022).

ICCRA, n.d. Ircca | Instituto de Regulación y Control del Cannabis. https://www.ircca.gub.uy/ (accessed 28 November 2022).

Ives, S., Wynberg, R. and Dutfield, G., 2020. Rooibos settlement omits other marginalized people. *Nature*, 577: 318–318. https://doi.org/10.1038/d41586-020-00056-x

Jelliffe, J., Lopez, R. and Ghimire, S., 2020. CBD Hemp Production Costs and Returns for Connecticut Farmers in 2020 (Zwick Center Outreach Report No. 66). University of Connecticut.

Johnson, B. and Andersen, A.D., 2012. Learning, Innovation and Inclusive Development: New perspectives on economic development strategy and development aid. Aalborg Universitetsforlag, Aalborg.

Johnson, R., 2018. Hemp as an Agricultural Commodity (Congressional Research Service Report). Congressional Research Service.

Jordan, B., 2021. Strawberry farm celebrates SA's first commercial dagga export - and it's high quality. TimesLIVE.

Kaiser, C., Cassady, C. and Ernst, M., 2015. Industrial Hemp Production (Center for Crop Diversification Crop Profile). University of Kentucky College of Agriculture, Food and Environment.

Kaplinsky, R., Morris, M., 2016. Thinning and Thickening: Productive Sector Policies in The Era of Global Value Chains. The European Journal of Development Research, 28: 625–645. https://doi.org/10.1057/ejdr.2015.29

Kavousi, P., Giamo, T., Arnold, G., Alliende, M., Huynh, E., Lea, J., Lucine, R., Tillett Miller, A., Webre, A., Yee, A., Champagne-Zamora, A. and Taylor, K., 2022. What do we know about opportunities and challenges for localities from Cannabis legalization? *Review of Policy Research*, 39: 143–169. https://doi.org/10.1111/ropr.12460

Kay, S., 2022. Prohibited Plants: Environmental Justice in Drug Policy. Transnational Institute, Amsterdam.

Kay, S., Jelsma, M. and Bewley-Taylor, D., 2020. Fair Trade cannabis: a road map for meeting the socio-economic needs and interests of small and traditional growers. *The Journal of Fair Trade*. https://doi.org/10.13169/jfairtrade.2.1.0027

Kepe, T., 2007. Medicinal plants and rural livelihoods in Pondoland, South Africa: Towards an understanding of resource value. *International Journal of Biodiversity Science & Management*, 3: 170–183. https://doi.org/10.1080/17451590709618171

Kepe, T., 2003. Cannabis sativa and rural livelihoods in South Africa: politics of cultivation, trade and value in Pondoland. Development Southern Africa, 20: 605–615. https://doi.org/10.1080/0376835032000149252

Kilmer, B., Caulkins, J.P., Kilborn, M., Priest, M. and Warren, K., 2021. Cannabis Legalization and Social Equity: Some Opportunities, Puzzles, and Trade-Offs. *Boston University Law Review*, 101: 1003–1041.

Klasen, S., 2010. Measuring and Monitoring Inclusive Growth: Multiple Definitions, Open Questions, and Some Constructive Proposals (Asian Development Bank Sustainable Development Working Paper Series). Asian Development Bank.

Komand Consulting, 2020. The European medical cannabis market. Komand Consulting.

Labat, n.d. Labat to lead the development of South Africa's cannabis industry – Labat Africa Group https://labat.co.za/labat-to-lead-the-development-of-south-africas-cannabis-industry/ (accessed 27 November 2022).

Lamers, M., 2021. Canada's legal cannabis market continues to erode illicit market's share. MJBizDaily. https://mjbizdaily.com/canadas-legal-cannabis-market-continues-to-erode-illicit-markets-share/

Lamers, M., 2020. Jamaica to lower medical cannabis industry entry barriers for small farmers. MJBizDaily. https://mjbizdaily.com/jamaica-to-lower-cannabis-industry-entry-barriers-for-small-farmers/ (accessed 28 November 2022).

Laqueur, H., Rivera-Aguirre, A., Shev, A., Castillo-Carniglia, A., Rudolph, K.E., Ramirez, J., Martins, S.S. and Cerdá, M., 2020. The impact of cannabis legalization in Uruguay on adolescent cannabis use. *International Journal of Drug Policy*, 80: 102748. https://doi.org/10.1016/j.drugpo.2020.102748

Lee, K., 2019. The Art of Economic Catch-Up: Barriers, Detours and Leapfrogging in Innovation Systems. Cambridge University Press.

Lewis, M., 2020. Cannabis in the eastern cape: a policy discussion document. Eastern Cape Socio Economic Consultative Council.

Louw Coetzee, M., 2022. Growing hemp: SA takes a step closer to commercial cultivation. *Farmers Weekly*. 15 September. https://www.farmersweekly.co.za/agri-business/agribusinesses/growing-hemp-sa-takes-a-step-closer-to-commercial-cultivation/

Lowitt, S., 2020a. Industrial development projects: Industrial hemp. Trade & Industrial Policy Strategies.

Lowitt, S., 2020b. Initial considerations for the creation of an inter-regional industrial hemp value chain between Malawi and South Africa (WIDER Working Paper 2020/23). UNU-WIDER.

Maas, D., 2022. Cannabis Country Report: Uruguay. CANNAVIGIA.

Madhusoodanan, J., 2019. Can cannabis go green? *Nature*, 572: S8–S9. https://doi.org/10.1038/d41586-019-02526-3

Malerba, F. and Lee, K., 2021. An evolutionary perspective on economic catch-up by latecomers. *Industrial and Corporate Change*, 30: 986–1010. https://doi.org/10.1093/icc/dtab008

Manthey, J., Freeman, T.P., Kilian, C., López-Pelayo, H. and Rehm, J., 2021. Public health monitoring of cannabis use in Europe: prevalence of use, cannabis potency, and treatment rates. *The Lancet Regional Health - Europe*, 10. https://doi.org/10.1016/j.lanepe.2021.100227

Manu, E., Douglas, M., Ntsaba, M.J. and Tarkang, E.E., 2021. Perspectives of illicit marijuana growers and traders on commercial legalisation of marijuana in South Africa: considerations for policy formulation. Substance Abuse Treatment, Prevention, and Policy, 16: 54. https://doi.org/10.1186/s13011-021-00391-w

Marchi, V.D., Maria, E.D., Krishnan, A. and Ponte, S., 2019. Environmental upgrading in global value chains. Handbook on Global Value Chains, 310–323.

Mark, T., Shepherd, J., Olson, D., Snell, W., Proper, S. and Thornsbury, S., 2020. Economic Viability of Industrial Hemp in the United States: A Review of State Pilot Programs (Economic Information Bulletin Number 217). United States Department of Agriculture: Economic Research Service.

Mazzucato, M., 2015. Entrepreneurial State: Debunking Public Vs. Private Sector Myths. Anthem Press.

McCain, N., 2022. Black farmers protest against Sahpra's medicinal cannabis licensing process. News24.

MedBud, n.d. MedCan Isando T16-17 Birthday Cake. MedBud. https://medbud.wiki/strains/medcan/isando-t16c0/ (accessed 28 November 2022).

Michigan Department of Agriculture and Rural Development, 2020. Industrial Hemp Ag Pilot Program: Final Report. Michigan Department of Agriculture and Rural Development.

Mills, E., 2021. To Make Cannabis Green, We Need to Grow It Outdoors. Slate.

Ministry of Health and Social Protection, 2017. Regulations For Medicinal Cannabis In Colombia Are Ready. https://www.minsalud.gov.co/English/Paginas/Regulations-For-Medicinal-Cannabis-In-Colombia-Are-Ready.aspx (accessed 28 November 2022).

Mitchell, C., 2021. Canada's cannabis 'green rush' yet to reap rewards. Financial Times.

Mjbiz, 2019. Cannabis genetics and how companies can protect intellectual property. MJBizDaily. https://mjbizdaily.com/how-cannabis-companies-can-protect-intellectual-property-in-the-wake-of-the-phylos-bioscience-uproar/ (accessed 28 November 2022).

Mokwena, K., 2016. "Consider our plight": A cry for help from nyaope users. *Health SA Gesondheid,* 21: 137–142. https://doi.org/10.1016/j.hsag.2015.09.001

Moodley, N., 2022. Labat enters joint agreement with CSIR to produce medicinal cannabis and hemp. Daily Maverick.

Moore, D., Graham, D., Li, W. and Hartmann, Z., 2021. Facilitating growth in the New Zealand Hemp Industry. Sapere / Ministry for Primary Industries.

Moreno, M.A., Jenkins, M., Binger, K., Kelly, L., Trangenstein, P.J., Whitehill, J.M. and Jernigan, D.H., 2022. A Content Analysis of Cannabis Company Adherence to Marketing Requirements in Four States. *Journal of Studies on Alcohol and Drugs*, 83: 27–36. https://doi.org/10.15288/jsad.2022.83.27

Morris, M. and Staritz, C., 2019. Industrialization paths and industrial policy for developing countries in global value chains. Handbook on Global Value Chains, 506–520.

Mthembi, P.M., Mwenesongole, E.M. and Cole, M.D., 2018. Chemical profiling of the street cocktail drug 'nyaope' in South Africa using GC–MS I: Stability studies of components of 'nyaope' in organic solvents. *Forensic Science International*,292: 115–124. https://doi.org/10.1016/j.forsciint.2018.08.001

NAMC, 2022. Agriculture and Agro-Processing Masterplan: Social Compact. National Agricultural Marketing Council.

Neslen, A. and Deutsch, J., 2020. Up in smoke? Hemp farmers fear EU decision. POLITICO.

New Frontier Data, 2021. The Global Cannabis Report: Growth and trends through 2025.

Nguyen, J. and Blood, M., 2022. Declining Cannabis Prices. EisnerAmper. https://www.eisneramper.com/declining-cannabis-prices-0722/ (accessed 27 November 2022).

Niño, H.P. and Oya, C., 2021. Contract farming. Handbook of Critical Agrarian Studies, 416–426.

Nkosi, P.I., 2021. Dagga and Data: Cannabis, Race, and Policing in Midcentury South Africa, 1932–1960. *The Social History of Alcohol and Drugs*,35: 232–259. https://doi.org/10.1086/716209

Nutt, D., 2020. Drugs Without the Hot Air: Making Sense of Legal and Illegal Drugs. UIT Cambridge.

Nutt, P.D., 2022. Cannabis (seeing through the smoke): The New Science of Cannabis and Your Health. Hachette UK.

Owens, B., 2019. The professionalization of cannabis growing. *Nature*, 572: S10–S11. https://doi.org/10.1038/d41586-019-02527-2

Owusu-Bempah, A., 2022. Opinion: Canada's legalization of cannabis is a success story, despite a shaky first act. Globe Mail.

Pardal, M., Decorte, T., Bone, M., Parés, Ò. and Johansson, J., 2022. Mapping Cannabis Social Clubs in Europe. *European Journal of Criminology*, 19: 1016–1039. https://doi.org/10.1177/1477370820941392

Pasche, S. and Myers, B., 2012. Substance misuse trends in South Africa. *Human Psychopharmacology: Clinical & Experimental*, 27: 338–341. https://doi.org/10.1002/hup.2228

PIC/S, n.d. Introduction. https://picscheme.org/en/about (accessed 28 November 2022).

Pinnock, D., 2019. Criminalisation key to Cape Town's drug wars. http://www.news.uct.ac.za/article/-2019-08-30-criminalisation-key-to-cape-towns-drug-wars (accessed 28 November 2022).

Placido, D.F. and Lee, C.C., 2022. Potential of Industrial Hemp for Phytoremediation of Heavy Metals. Plants 11, 595. https://doi.

org/10.3390/plants11050595

Plumb, J., Demirel, S., Sackett, J.L., Russo, E.B. and Wilson-Poe, A.R., 2022. The Nose Knows: Aroma, but Not THC Mediates the Subjective Effects of Smoked and Vaporized Cannabis Flower. *Psychoactives*, 1: 70–86. https://doi.org/10.3390/psychoactives1020008

Prohibition Partners, 2022. The North American Cannabis Report: 3rd Edition. Prohibition Partners.

Prohibition Partners, 2021. Global cannabis report: 2nd edition.

Prohibition Partners, 2019. The African cannabis report: 2nd ed. Prohibition Partners, London.

Public Health Agency of Canada, n.d. Cannabis Use - Data Blog - Public Health Infobase. https://health-infobase.canada.ca/cannabis/ (accessed 27 November 2022).

Quinton, S., 2021. The Hemp Boom is Over. What Now? https://pew.org/3qVBjH2 (accessed 28 November 2022).

Ras, D., 2022. SA: "Our experience in potatoes is helping us succeed in the cannabis industry". https://www.mmjdaily.com/article/9454884/sa-our-experience-in-potatoes-is-helping-us-succeed-in-the-cannabis-industry/ (accessed 28 November 2022).

Riboulet-Zemouli, K., 2022. High compliance, a lex lata legalization for the non-medical cannabis industry: How to regulate recreational cannabis in accordance with the Single Convention on narcotic drugs, 1961. FAAAT editions, Paris and Washington, DC.

Richards, M., 2022. Medical Cannabis Legalisation in Europe. Volteface.

Rivera-Aguirre, A., Castillo-Carniglia, A., Laqueur, H.S., Rudolph, K.E., Martins, S.S., Ramírez, J., Queirolo, R. and Cerdá, M., 2022. Does recreational cannabis legalization change cannabis use patterns? Evidence from secondary school students in Uruguay. *Addiction*, 117: 2866–2877. https://doi.org/10.1111/add.15913

Robertson, K.and Thyne, M., 2021. Legalization of recreational cannabis: Facilitators and barriers to switching from an illegal to a legal source. *Preventive Medicine Reports*, 24: 101639. https://doi.org/10.1016/j.pmedr.2021.101639

Roelf, W., 2022. South Africa's Ramaphosa pledges fundamental economic reform. Reuters.

Rogeberg, O., Bergsvik, D., Phillips, L.D., van Amsterdam, J., Eastwood, N., Henderson, G., Lynskey, M., Measham, F., Ponton, R., Rolles, S., Schlag, A.K., Taylor, P. and Nutt, D., 2018. A new approach to formulating and appraising drug policy: A multi-criterion decision analysis applied to alcohol and cannabis regulation. International Journal of Drug Policy, 56: 144–152. https://doi.org/10.1016/j.drugpo.2018.01.019

Rolles, S. and Slade, H., 2022. How to Regulate Cannabis: A Practical Guide. Transform Drug Policy Foundation.

Rossi, E., 2021. In Monitoring Global Cannabis Flows, Will the INCB Turn a New Direction? New Frontier Data. https://newfrontierdata.com/cannabis-insights/in-monitoring-global-cannabis-flows-will-the-incb-turn-a-new-direction/ (accessed 28 November 2022).

Rupasinghe, H.P.V., Davis, A., Kumar, S.K., Murray, B. and Zheljazkov, V.D., 2020. Industrial Hemp (Cannabis sativa subsp. sativa) as an Emerging Source for Value-Added Functional Food Ingredients and Nutraceuticals. *Molecules*, 25: E4078. https://doi.org/10.3390/molecules25184078

Sabaghi, D., 2022. Pfizer Bets On Medical Cannabis With $6.7 Billion Acquisition. Forbes. https://www.forbes.com/sites/dariosabaghi/2021/12/20/pfizer-to-enter-the-medical-cannabis-industry-with-67-billion-acquisition/

SAHPRA, 2021. Section 21 Access to Unregistered Medicines. South African Health Products Regulatory Authority.

SAHPRA, 2020. Cannabis & Related Substances: Frequently Asked Questions.

SAHPRA, n.d. Cannabis and related substances: Frequently asked questions.

SAHPRA, n.d. Guideline for cultivation of cannabis and manufacture of cannabis-related pharmaceutical products for medicinal and research purposes. South African Health Products Regulatory Authority.

Santiago, F., Weiss, M., 2018. Demand-driven policy interventions to foster sustainable and inclusive industrial development in developing countries (Department of Policy, Research and Statistics Working Paper), 17/2018. UNIDO, Vienna.

Scheibe, A., Shelly, S. and Versfield, A., 2020. Prohibitionist Drug Policy in South Africa—Reasons and Effects, in: Drug Policies and Development: Conflict and Coexistence. Brill, Leiden.

Schindlers, 2022. MEDIA RELEASE - Update regarding THE HAZE CLUB & THE GROW CLUB MODEL - Schindlers Attorneys. https://www.schindlers.co.za/news/media-release-update-regarding-the-haze-club-the-grow-club-model/ (accessed 28 November 2022).

Schroyer, J., 2022. For some, US marijuana industry becoming a David-versus-Goliath battle. MJBizDaily. https://mjbizdaily.com/is-big-versus-small-battle-emerging-in-us-cannabis-industry/

Shelly, S. and Sigsworth, R., 2020. Rethinking prohibition: Towards an effective response to drugs in South Africa (ENACT Research Paper No. 19). ENACT.

Simakis, M., 2020. Indoors, Greenhouses or Outdoors: Where Are Cannabis Cultivators Growing? Cannabis Business Times.

Singh, A., 2022. Cannabis biopiracy in the era of climate chaos - Grow OpportunityGrow Opportunity. https://www.growopportunity.ca/cannabis-biopiracy-in-the-era-of-climate-chaos/ (accessed 28 November 2022).

Singular, E., 2022. Hemp Industry Stakeholders Back Carbon Credit Research as Prices for CO2e Skyrocket. New Frontier Data. https://newfrontierdata.com/cannabis-insights/hemp-industry-stakeholders-back-carbon-credit-research-as-prices-for-co2e-skyrocket/ (accessed 27 November 2022).

Singular, E., 2021. How Many Acres Have Farmers Lost to Hot Hemp? New Frontier Data. https://newfrontierdata.com/cannabis-insights/how-many-acres-have-farmers-lost-to-hot-hemp/ (accessed 12.9.22).

SIZA, n.d. THE SIZA PROGRAMME – The Sustainability Initiative of South Africa (SIZA). https://siza.co.za/about/the-siza-programme/ (accessed 28 November 2022).

Slater, D., 2020. Labat concludes agreement to buy-out Ace Genetics for R1.8m. Engineering News. 9 December. https://www.engineeringnews.co.za/article/labat-concludes-agreement-to-buy-out-ace-genetics-for-r18m-2020-12-09/rep_id:4136

Soloveichik, R., 2021. Tracking Marijuana in the National Accounts (BEA Working Paper Series, WP2021-5). Bureau of Economic Analysis.

Stevens, B., 2022. Europe's First Recreational THC Cannabis Trial Will "Open The Door For THC" In Switzerland Like "CBD Opened The Door For Cannabis." BusinessCann.

Summers, H.M., Sproul, E. and Quinn, J.C., 2021. The greenhouse gas emissions of indoor cannabis production in the United States. *Nature Sustainability*, 4: 644–650. https://doi.org/10.1038/s41893-021-00691-w

The Economist, 2022. New York state reckons it's got cannabis legalisation right. The Economist.

UNCTAD, 2022. Commodities at a glance: Special issue on industrial hemp. United Nations Conference on Trade & Development.

United Nations, 2020. UN commission reclassifies cannabis, yet still considered harmful. UN News. https://news.un.org/en/story/2020/12/1079132 (accessed 1 October 2022).

UNODC, U.N.O. on D. and C., 2022. World Drug Report 2022. United Nations Office on Drugs and Crime, Vienna.

UNODC, U.N.O. on D. and C., 2021. World Drug Report 2021. United Nations Office on Drugs and Crime, Vienna.

UNODC, U.N.O. on D. and C., 2020. In Focus: Cannabis legalization - World Drug Report 2020. United Nations Office on Drugs and Crime, Vienna.

van Amsterdam, J., Nutt, D., Phillips, L. and van den Brink, W., 2015. European rating of drug harms. Journal of Psychopharmacology, 29: 655–660. https://doi.org/10.1177/0269881115581980

Vanstone, K., 2020. The Importance of Cannabis Genetics. INN. https://investingnews.com/daily/cannabis-investing/the-importance-of-cannabis-genetics/ (accessed 28 November 2022).

Vecchiato, P., 2022. EU's New Import Rules Cost South African Citrus Exporters $12 Million. Bloomberg.com. https://www.bloomberg.com/news/articles/2022-08-10/eu-s-new-rules-cost-south-african-citrus-exporters-12-million

Walsh, J.and Ramsey, G., 2016. Uruguay's Drug Policy: Major Innovations, Major Challenges (Center for 21st Century Security and Intelligence Latin America Initiative). Brookings Institute.

Watkins, A., Papaioannou, T., Mugwagwa, J. and Kale, D., 2015. National innovation systems and the intermediary role of industry associations in building institutional capacities for innovation in developing countries: A critical review of the literature. *Research Policy,* 44 1407–1418. https://doi.org/10.1016/j.respol.2015.05.004

Westendarp, L., 2022. 5 things to know about Germany's push to legalize cannabis. POLITICO.

Whitehill, J.M., Trangenstein, P.J., Jenkins, M.C., Jernigan, D.H. and Moreno, M.A., 2020. Exposure to cannabis marketing in social and traditional media and past-year use among adolescents in states with legal retail cannabis. *The Journal of Adolescent Health: official publication of the Society for Adolescent Medicine*, 66, 247–254. https://doi.org/10.1016/j.jadohealth.2019.08.024

WHO, 2018. Cannabidiol (CBD): Critical Review Report (Expert Committee on Drug Dependence Fortieth Meeting). World Health Organisation, Geneva.

Wilson, H., Bodwitch, H., Carah, J., Daane, K.M., Getz, C.M., Grantham, T.E. and Butsic, V., 2019. First known survey of cannabis production practices in California. *California Agriculture*, 73. https://doi.org/10.3733/ca.2019a0015

WIPO, n.d. Disputing a Name, Developing a Geographical Indication. https://www.wipo.int/ipadvantage/en/details.jsp?id=2691 (accessed 28 November 2022).

Wynberg, R., 2017. Making sense of access and benefit sharing in the rooibos industry: Towards a holistic, just and sustainable framing. *South African Journal of Botany, Herbal Teas*, 110: 39–51. https://doi.org/10.1016/j.sajb.2016.09.015

Wyse, J., Luria, G., 2021. Trends in intellectual property rights protection for medical cannabis and related products. Journal of Cannabis Research, 3: 1. https://doi.org/10.1186/s42238-020-00057-7

APPENDIX 1

List of interviewees

Interview number	Interviewee	Interview date
1	Ras Prince, Cannabis Development Council of South Africa	October 2021
2	Jason O'Donoghue, South African Cannabis Community and Regulatory Association	October 2021
3	Lennox Xolile Mtshagi, Black Farmers Association of South Africa	October 2021
4	Myrtle Clark, Fields of Green for ALL	October 2021
5	Antony Cohen and Tebogo Thlopane, Cannabis Trade Association Africa	October 2021
6	SA-based medical cannabis producer (1)	October 2021
7	Lawrence Sharpley, Canna Consulting	November 2021
8	Ricky Stone, Cullinan & Associates	November 2021
9	Ayanda Bam, BCubed Consulting	November 2021
10	Trenton Birch, Cheeba Africa	June 2022
11	SA-based medical cannabis producer (2)	June 2022
12	SA-based medical cannabis producer (3)	June 2022
13	Greg Beadle, Farmer2Pharma	June 2022
14	Jeff Verlinden, Separations	June 2022
15	SA-based medical cannabis producer (4)	June 2022
16	SA-based medical cannabis producer (5)	June 2022
17	SA-based medical cannabis producer (6)	June 2022
18	European cannabis distributor (1)	June 2022
19	European equipment supplier	June 2022
20	European cannabis distributor (2)	June 2022
21	US input supplier	June 2022
22	US consultancy	June 2022
23	European pharmaceutical manufacturer	June 2022
24	European lab services provider	June 2022
25	European consultancy	June 2022

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