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Policy Analysis Policy reform and the international future of Moroccan *Cannabis* production

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A R T I C L E I N F O	A B S T R A C T
Keywords: Cannabis Morocco Legalisation Regulation Agriculture Export	In 2023, Morocco produced the first legal <i>Cannabis</i> crop of any illegal hashish-producing country, only three years after it legalised the cultivation of <i>Cannabis</i> for medical and industrial purposes. Nevertheless, as the country continues to amend its regulatory framework and economic policies, numerous questions and uncertainties persist regarding the success of its strategy for the export of <i>Cannabis</i> products and the evolution of its domestic consumer market. This current study details and explains how Morocco has advantageously legalised what it calls "licit uses of cannabis", notably by not referring to hemp, but also by making the strategic decision not to adopt an overall tetrahydrocannabinol (THC) threshold. This study also addresses key agricultural technicalities, such as how higher legal THC levels benefit cannabidiol (CBD) yields and how this directly impacts economic competitiveness, as well as how legal rules and details are structuring a new and rapidly changing global legal cannabinoid market. This study goes beyond the case of Morocco by considering what diverse and evolving international legislations mean for potential future Moroccan exports, depending on how CBD is viewed and regulated in different countries, whether as a pharmaceutical, a wellness product, or a food supplement. The study concludes that while the Moroccan authorities have quickly and pragmatically adapted their regulations, both at the production and consumption level, the future of Morocco's legal <i>Cannabis</i> industry remains largely dependent on local and global environmental and economic factors that will influence its development and viability.

Introduction

Morocco has long been considered one of the largest, if not the largest, producer of hashish (cannabis resin) in the world (UNODC, 2003; Blickman, 2017; Chouvy, 2019). However, the importance of Morocco's illegal hashish production remains a vexed question. Indeed,

whether or not Morocco is still the world's leading producer of hashish is difficult, if not impossible, to determine, as there is no reliable recent data on production either in Morocco or in Afghanistan, India and Lebanon, the other main hashish-producing countries (Chouvy, 2016, 2019). While the area under *Cannabis*¹ cultivation in Morocco has declined since the mid-2000s, hashish production has undergone

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¹ According to the 1961 Single Convention on Narcotic Drugs (Article 1 b-d), "cannabis" refers to the flowering or fruiting tops of the *Cannabis* plant, referred to as the *Cannabis sativa* L. species; "cannabis resin" refers to the resin separated from the *Cannabis* plant, known under the colloquial name hashish; and "extracts and tinctures" refer to any such extracts and tinctures (United Nations, 1961). Hereinafter *Cannabis* will refer to the genus *Cannabis*, while herbal cannabis will refer to the psychotropic flowering or fruiting tops.

significant modernisation, characterised by the extensive use of high-yielding *Cannabis* cultigens² and irrigation techniques. These developments have led to a significant increase in hashish yields, potentially compensating for the decline in the area under cultivation (Chouvy & Afsahi, 2014, Chouvy, 2016, Chouvy & Macfarlane, 2018).

But Morocco's exception is not limited to being, or having been, the world's leading illegal hashish producer. Indeed, in 2023 Morocco produced the first legal Cannabis crop of any illegal hashish-producing country. This is despite the fact that Lebanon, ranked by the United Nations Office on Drugs and Crime as the world's third largest supplier of hashish in 2019 (UNODC, 2019), became the first hashish-producing country to legalise "the cultivation of cannabis for medical and industrial purposes" in 2020 (Law 178 of 28 May 2020), but has yet to produce its first legal crop. In Morocco, the legalisation of Cannabis cultivation for "medical, cosmetic and industrial purposes" was voted by the parliament on 26 May 2021 (Law 13-21). While the first legal Moroccan harvest took only two years to materialise and was modest at just 286 hectares, the 2024 harvest has been much larger (data not available at time of writing) as Moroccan authorities have approved the cultivation of Cannabis on 2552 hectares in the Northern provinces of Taounate, Chefchaouen and Al Hoceima (Ouzzane, 2024).

Morocco's legalisation comes against a backdrop of global enthusiasm for the legal *Cannabis* industry, with many countries legalising the cultivation of *Cannabis* for a variety of purposes and under equally varied and fluctuating rules and procedures. The growth rates of national markets, and therefore the global legal *Cannabis* market, are attracting both traditional producing countries and their small farming communities in Africa, Latin America and Asia, as well as large, wellcapitalised private companies from Canada and the United States of America (USA). While Morocco has failed to remove illegal *Cannabis* cultivation from its northern Rif region over the past few decades, it has proven much better at reforming a small part of its illegal industry into a legal one.

However, as this article explains, many questions and uncertainties remain, and Morocco is obviously and understandably still adjusting its regulations and policies, both in terms of which *Cannabis* cultigens are cultivated and how its local consumer market will evolve. However, the future of the legal Moroccan *Cannabis* industry is largely dependent on local and global environmental and economic factors that will affect its development and viability. The fate of the legal Moroccan *Cannabis* industry will undoubtedly be determined by its choice of agricultural strategies and techniques in the context of climate change, particularly of recurrent droughts and rising temperatures, but also by how national production and consumer markets develop globally. The same can be said of the large illegal hashish production in Morocco, which has long struggled with overproduction, water shortages and rising temperatures (Chouvy, 2023).

This article therefore critically examines the regulatory and technical

choices Morocco has made to build a legal *Cannabis* industry. It details how it has made what it calls "licit uses of cannabis" possible by not referring to hemp, the term widely used to describe the lowtetrahydrocannabinol (THC) *Cannabis* whose production is legal in over 30 countries (U.S. International Trade Commission, 2023). This article explains why Morocco's decision not to adopt an overall (THC) threshold was a strategic choice in the highly diverse, complex and rapidly changing context of international *Cannabis* regulation. It then explains why and how the production of cannabidiol (CBD) is determined by both legal and epigenetic factors, which is very important given the size of the global CBD market and how much it is expected to grow in the coming years.

To provide a balanced and informed perspective on Morocco's potential production and export strategy, the article then analyses what international legislations mean for potential future Moroccan exports, depending on how CBD is viewed and regulated in different countries, whether as a pharmaceutical, a wellness product, or a food supplement. To show how much Morocco has achieved in three years, the article subsequently presents the case study of the first legal export (2023) of CBD-rich hashish to Switzerland.

The article concludes with a discussion of the rapid adaptation of Moroccan regulatory framework following the initial export. It discusses how changes have been implemented at both the production level (approval of the local *kif* landrace) and the consumption level (setting the rules for the development of a local market). It also explains what this means for the development of Morocco's legal *Cannabis* industry, both domestically and abroad.

Informing data and policy materials

This article provides a policy analysis of Morocco's evolving Cannabis regulatory landscape and cultivation and production practices. It is based on work carried out in 2023 and 2024 and draws on legal, regulatory and comparative policy documents, as well as on direct fieldwork (direct observation in the field, semi-structured interviews, open discussions with Cannabis farmers, hashish producers, exporters) and expert interviews (in Morocco, France, the USA, and Switzerland) made possible by over two decades of research in the Rif region. These empirical insights are used to illustrate and support the analysis, rather than provide a basis for generalisable findings. Previous and new contacts in the field were mostly obtained by relying on chain referral sampling. To protect their anonymity, as the legality of Cannabis economies varies internationally, respondents are referred to by their initials where necessary. The current study also draws on a wide range of secondary data from official publications and scientific and journalistic literature on agricultural, botanical, biochemical, genetic, economic and legal issues related to the cultivation of Cannabis and its derivatives.

Morocco advantageously legalised some uses of "cannabis", not "hemp"

While the distinction between (industrial/wellness) hemp (type 3 chemovar³) and (drug/narcotic) cannabis (type 1 chemovar) is common in countries that produce hemp (never called *Cannabis* or cannabis),

 $^{^{2}\,}$ To clarify terminology, variety refers to a botanical taxonomic rank (second to last, before form), whereas cultivar, in horticulture and according to the rules of the International Code of Nomenclature for Cultivated Plants, is a cultivated "variety" (strictly speaking cultigens) defined by a distinct, uniform and stable (DUS) phenotype, which excludes all, if not most, landraces, since they are genetically heterogeneous populations. Therefore, the best way to refer globally to the different cultivated Cannabis plants, whether or not they are cultivars, is to speak of cultigens ("cultivated plants"), i.e. "deliberately selected plants that may have arisen by intentional or accidental hybridisation in cultivation, by selection from existing cultivated stocks, or from variants within wild populations that are maintained as recognisable entities solely by continued propagation" (Brickell et al., 2016: 144). Consequently, if all cultivars are cultigens, not all cultigens are cultivars. In fact, very few certified seeds produce cultigens that meet the DUS standard and therefore very few can be registered as cultivars. The same, of course, applies to landraces: they are cultigens that clearly cannot be considered as either varieties or cultivars, but they happen to be promoted or sold as cultivars.

³ The large variability of chemotypical characteristics of *Cannabis* inspired the division of the genus into five recognized groups (chemotypes or chemovars: distinction ignored here) within the genus, "depending on different concentrations of major cannabinoids (Δ^9 -THC; CBD; and CBG). The five recognized chemotypes of cannabis include: (I) the drug-type plants (narcotic) with a high content of the psychotropic Δ^9 -tetrahydrocannabinol (Δ^9 -THC); (II) medicinal cannabis with a 1:1 content of Δ^9 -THC: CBD; (III) industrial fiber hemp that has CBD as a predominant constituent and a minimum content of Δ^9 -THC (0.2% *w/w*); (IV) fiber-type plants that contain cannabigerol (CBG) as the main cannabinoid; (V) fiber-type plants largely devoid of cannabinoids". (Salamone et al., 2022: 2).

Morocco refers only to "cannabis" in Article 2 of the French version of its Law 13–21 "on the licit uses of cannabis" where it states that "the cannabis plant means any plant of the genus cannabis" (but without capitalising the genus name – contrary to what should be done – in the original legal document).

In other words, Morocco does not distinguish between hemp (or chanvre, as the text is in French) and Cannabis, or even between hemp and cannabis, but between legal and illegal⁴ uses of "cannabis". This lack of distinction is probably due to the fact that both "cannabis", in the official French translation of Law 13-21, and "chanvre à kif" (literal translation: hemp for kif), in the dahirs (royal decrees) dealing with Cannabis, are translations of the unique Arabic term al-qinab al-hindi used in the original Arabic versions of the legal texts.⁵ The distinction between hemp and *Cannabis* probably never existed in Morocco,⁶ as the versatility of the kif cultigen meant that it could be used for both its fibres (kif is characterised by long stems) and its cannabinoids. In this way, Morocco has avoided, either voluntarily or due to linguistic constraints (the possible difficulty of translating a single Arabic term into two French terms), the terminological confusion that exists in France and elsewhere between hemp and "cannabis" (where the polysemy of the word "cannabis" makes it difficult to distinguish whether it refers to the plant or the drug).

Article 5 of Law 13–21 then stipulates that "Authorization for the cultivation and production of cannabis is granted only for the quantities needed to meet the requirements of manufacturing activities for medical, pharmaceutical and industrial purposes." Article 2 defines the "industrial purposes" as "any purpose related to industrial activities, including the food and cosmetics industries, other than the medical and pharmaceutical industries." Article 6 specifies that "Authorization to grow and produce cannabis varieties with a psychoactive substance content of tetrahydrocannabinol (THC) that exceeds the level set by regulation can only be granted for the medical and pharmaceutical industries." The THC content is set at 1 % of total THC by decree 1297–22 (p. 1444 of Official Bulletin n° 7122 in its official French translation) of 12 May 2022.

Whether or not this choice of terminology is part of a deliberate strategy by Morocco, referring to the genus *Cannabis* without making an artificial distinction between hemp and cannabis or *Cannabis*⁷ has the advantage of clarity, as definitions of hemp as low-THC *Cannabis* are based on factors such as different low-THC levels, which have been arbitrarily set and vary between countries and over time. Indeed, referring to hemp instead of *Cannabis* does not clarify the terminology, since *Cannabis* includes all five chemotypes of the genus, whereas hemp includes three of its five chemotypes but does not distinguish between non-intoxicating psychotropic hemp (chemotypes III and IV) and non-psychotropic hemp (chemotype V). Also, types IV and V are usually referred to as industrial hemp. The result is a confusing and complicated terminology and global regulatory landscape that affect the commercial strategies of exporting producers around the world who must ensure that their products meet very different and changing criteria.

Morocco's lack of an overall THC limit contrasts with the rest of the world

To assess the export potential of Moroccan production of legal

Cannabis derivatives, it is necessary to consider how the main potential import markets regulate these derivatives and their imports. The choice of France and other EU countries, as well as Switzerland, is justified by the fact that these countries constitute privileged export markets, given their geographical proximity and the historical and linguistic links that bind Morocco to some of them, as well as certain legal convergences (Switzerland). The case of the United States is justified by the fact that it has the potential to be one of the largest import markets in the world, that it has played a pioneering role in the development of a legal *Cannabis* market, and that some of its economic operators are genuinely and increasingly interested in Morocco's production potential. A study of the specific features of the legal *Cannabis* markets in these different countries, as well as the changes in their legislation and regulation, will help to assess the development potential of the Moroccan legal *Cannabis* economy, given the country's primary focus on developing its exports.

In contrast to most of the world, where a 0.3 % (total) THC limit for low-THC Cannabis ("hemp") is the rule, Morocco has adopted a 1 % THC limit for all products except those intended for medical and pharmaceutical use, which are not bound by THC limits. Morocco is therefore not excluding itself from any product other than those intended for the recreational market, or from any international market, particularly the two largest markets in the world today, the EU and the USA, where 0.3 % is the THC limit for "hemp" and hemp-derived products. This is particularly the case because Morocco is a hashish-producing country, not a producer of herbal cannabis. Indeed, unlike herbal cannabis, hashish can - and in most cases must - be remediated (see below on remediation) to comply with either a 0.3 % or 1 % THC limit, because hashish consists mostly of cannabinoid-rich trichomes (which means that the THC percentage of a given plant - on a dry weight basis - is multiplied by 1.5 to 3, depending on the sifting process, after the trichomes have been separated from the remaining plant material). In any case, while Morocco has adopted a 1 % THC limit for the production of goods that are not medicinal or pharmaceutical, it only allows the sale and consumption on its territory of Cannabis derivatives with a 0.3 % THC limit (most likely for cultural/religious reasons).

In the EU, the THC limit for "industrial hemp" (as all hemp was called before it became a legal source of CBD) was first set at 0.5 % in 1984, then reduced to 0.3 % in 1987, and further reduced to 0.2 % in 1999, reportedly "to prevent the cultivation of illicit drug–type *Cannabis* in hemp fields" (Sgrò et al., 2021: 3400). In October 2020, the European Parliament finally voted in favour of restoring the level to 0.3 %, partly to make the European hemp industry slightly more competitive (access to a wider range of hemp cultigens, cultivation in different soil and climate conditions, increased CBD yields, etc.). From January 2023, the EU considers that "raw true hemp [that is, including flowering and fruiting tops] falling under CN code 5302 10 must have a THC content not exceeding 0.3 %" (European Commission, 2024).

France provides us with a very relevant example of industrial hemp production and legislation, as it is often presented as the largest hempgrowing country in the EU, with an estimated 21,700 hectares (ha) under cultivation in 2022 (European Commission, 2024). However, it is very difficult, if not impossible, to obtain reliable estimates of hemp cultivation either in France, in the EU, or even worldwide, because "there is no single source for data pertaining to the production area and quantity of hemp and definitions are sometimes incomplete and even conflicting" (Textile Exchange, 2023: 18). For example, the French inter-professional association InterChanvre, which lists areas under hemp in France, only includes hemp grown for fibre and not for cannabinoids (interview, InterChanvre, May 2024). In the absence of an official national survey of hemp cultivation in France, the 600 to 1000 hectares estimated by the French Federation of Cannabinoid Producers (AFPC) to be devoted to CBD production must be added to the data collected by InterChanvre to get an idea of the total area under hemp cultivation in the country (interview, AFPC, May 2024). Even on a global scale, only the areas where so-called industrial or fibre hemp is grown are generally counted. This is what the data from the Food and

 $^{^{\}rm 4}\,$ In fact, the term used is licit, but due to space limitations we will not discuss the distinction.

⁵ The historical etymology of the terms cannabis (a Scythian word), qanab, hemp and chanvre is highly controversial, both in terms of their origin and their morphological transformation.

⁶ Although the Arabic *qanab* logically predated *al-qinab al-hindi* in classic Arab texts, as was the case with hemp and *chanvre* compared to Indian hemp and *chanvre indien*.

⁷ A conscious terminological strategy would have been for the Moroccan authorities to make a distinction between the genus, or plant, and its flowers.

Agriculture Organization of the United Nations shows (lists only "true hemp, raw or retted"⁸), and what is confirmed by the 2023 report on global hemp fibre production by Textile Exchange. According to this report, France had the second largest area under hemp cultivation in 2021 in the world (23 % of the world's cultivated area), after North Korea and ahead of China, but was the first producer of hemp fibre by weight (47 % of the world's total) (Textile Exchange, 2023: 18–21).

In the USA, where the Marihuana Tax Act of 1937 made the possession or sale of cannabis illegal under federal law, except for medical and industrial purposes, all *Cannabis* cultivation, including hemp, became illegal when the Controlled Substances Act was passed in 1970. Only in 2018 did the Agriculture Improvement Act of 2018, commonly known as the Farm Bill, amend the Controlled Substances Act by excluding hemp from the statutory definition of "marihuana".⁹ In its Section 297A, the AIA specifies that hemp means "the plant Cannabis sativa L. and any part of that plant [...], whether growing or not, with a delta-9 tetrahydrocannabinol concentration of not >0.3 per-cent on a dry weight basis." According to the USA Department of Agriculture's Farm Service Agency, in 2022, 8,871 hectares of hemp were cultivated, of which 3,490 hectares were for fibre hemp and 3,130 hectares for "CBD hemp" (the rest being hemp for grain and seed) (FSA Crop Acreage Data compiled by Hemp Benchmarks¹⁰).

However, lower legal THC levels inevitably make the EU, USA and even Canadian CBD industries less competitive than those in countries that have approved higher THC levels (up to 1 %) because lower THC levels mean lower CBD yields: indeed, because THCA is a by-product of CBDA synthesis,¹¹ the CBD yield of plants with 1 % THC is potentially three times higher than that of plants with only 0.3 % THC. For example, Australia, the Czech Republic, Ecuador, Malawi, Switzerland, Thailand, Uruguay and now Morocco are among the countries that allow the cultivation of hemp cultigens with a THC content of 1 %, while Italy tolerates exceeding the 0.3 % limit up to 0.6 % (Sgrò et al., 2021: 3400). The case of Italy shows how complicated and unreliable the hemp and CBD markets are, as the Meloni government was still trying to ban the cultivation of hemp or "light cannabis" in the country at the end of 2024, after having classified CBD as a narcotic drug in June 2024, contrary to how the EU defines "drugs" and "narcotics".¹²

To add to the complexity of the world market and to the challenge that it poses to countries like Morocco trying to break into what is still a very immature and unstable international market, "beyond the allowable THC level for the hemp plant itself, some countries have established different allowable THC levels for specific plant parts and/or end products" (U.S. International Trade Commission, 2023). For example,

¹⁰ https://www.hempbenchmarks.com/hemp-market-insider/how-much-h emp-was-planted-in-2023/ Page consulted on 24 July 2024. "in Australia and New Zealand, maximum THC levels are set as below 1 percent for industrial hemp (e.g., leaves, fibers, and flowers), at 2 percent for cannabidiols (CBD) extracts, and below 0.5 percent for hemp seed." (ibidem) To make things even more complex, different rules apply in different countries within the EU. For example, while the EU does not require CBD imports to come from *Cannabis* cultigens listed in the EU's Common Catalogue of Varieties of Agricultural Plant Species (only applies to hemp cultivation that benefits from support from the Common Agricultural Policy¹³ and not to CBD since it is not considered as an agricultural product¹⁴), France does (Order of December 30, 2021, implementing Article R. 5132–86 of the French Public Health Code). Therefore, the global legal cannabis market is characterised by a high degree of complexity, which renders exports from countries such as Morocco particularly challenging and subject to legal changes.

Morocco's international Cannabis strategy, from Cannabis rescheduling to THC ratio

Increasing the legal THC content of *Cannabis* has the advantage of facilitating the production and marketing of CBD, the psychoactive but non-intoxicating phytocannabinoid that is widely promoted and valued (although still controversially) for its health and wellness benefits. Depending on the maximum CBDA to THCA ratio, which has yet to be scientifically determined but is generally around 20:1 and can reportedly be as high as 35:1 or even 40:1 (Midwest (BG10) cultigen¹⁵ for example), most *Cannabis* cultigens will therefore produce around 6 % of (total) CBD by the time the crop reaches the 0.3 % total THC limit, but some other cultigens, when grown under optimal conditions, will produce as much as 10 or even 12 % (Johnson & Wallace, 2021; Stack et al., 2021; interviews with different geneticists in July 2024).

However, even though CBD consumption does not lead to an altered state of consciousness, i.e. a state that is significantly different from a normal waking or baseline state (Garcia-Romeu & Tart, 2013: 129; Farthing, 1992: 202), and is not regulated as a "narcotic drug" (in the legal sense of the term according to the 1961 UN Single Convention on Narcotic Drugs) or a psychotropic substance (in the legal sense¹⁶ of the term according to the 1971 UN Convention on Psychotropic Substances), its marketing in both the USA and the EU (as of 2024) still suffers from inappropriate existing food and supplement regulatory frameworks.

For instance, the European Commission considers CBD to be a novel food under the EU Novel Food Regulation (EU 2015/2283) because, unlike seeds, seed flour, seed protein powder or seed oil, there is no evidence of significant human consumption of CBD extract or isolate before 15 May 1997. After the European Food Safety Authority (EFSA) began assessing applications in January 2023, its Panel on Nutrition, Novel Foods, and Food Allergens (NDA) "identified several knowledge gaps" that needed to be addressed before the evaluation of CBD could be finalized (Lachenmeier et al., 2023).¹⁷

In fact, authorities in both the USA and the EU have stated that "the

⁸ FAO Statistical Database: https://www.fao.org/faostat/en/#data Page consulted on 20 July 2024.

⁹ Marijuana is a legal term in the United States of America, where it seems that the word (of uncertain etymology) was first recorded in print on 18 April 1887 in the Memphis Appeal newspaper. The word came to refer to the *Cannabis* plant in the Marihuana Tax Act of 1937, and was subsequently used as a legal term to refer to the mind-altering drug produced by the *Cannabis sativa* plant. First spelt as marihuana, marijuana gave rise to mary jane in English and marie-jeanne in French. Memphis Appeal article: https://guides.loc.gov/ch ronicling-america-marihuana/selected-articles. See also Piper, 2005, and MacDonald, 2023.

¹¹ *Cannabis* produces THC acid and CBD acid, precursors of THC and CBD, which are decarboxylated forms of THCA and CBDA transformed by exposure to heat (smoking for example).

¹² "EU law makes reference inter alia to two United Nations conventions: the Convention on Psychotropic Substances and the Single Convention on Narcotic Drugs." (Court of Justice of the European Union, Judgment in Case C-663/18, 19 November 2020). Neither convention mentions CBD, but cannabis, cannabis resin, and cannabis extracts and tinctures are considered narcotics (which, strictly speaking, would make cannabis products containing CBD narcotics).

¹³ See https://agriculture.ec.europa.eu/farming/crop-productions-and-plant -based-products/hemp_en Page consulted on 3 October 2024.

¹⁴ "CBD, extracted from the Cannabis sativa plant in its entirety, cannot be regarded as an agricultural product, unlike, for example, raw hemp." (Court of Justice of the European Union, Judgment in Case C-663/18, 19 November 2020).

¹⁵ Registered in the EU's Common Catalogue of Varieties of Agricultural Plant Species and sold by France Botanique Services: https://www.francebotaniques. com/produit/graines-cbd-midwest/ Page consulted on 25 July 2024.

¹⁶ Strangely, the legal sense does not respect the biochemical sense of the term, as CBD is clearly a psychotropic substance. CBD is far from being the only psychotropic substance that is not included in the 1971 Convention (cocaine and heroin are also excluded).

¹⁷ See also : https://www.efsa.europa.eu/fr/efsajournal/pub/7322?etrans=fr Page consulted on 7 October 2024.

effects of CBD on the liver, gastrointestinal tract, endocrine system, nervous system, psychological function and reproductive system" need to be clarified (Lachenmeier et al., 2023: 66). Novel food regulations therefore pose an existential threat to European cannabinoid production, particularly organic production of food supplements, but could stifle an EU CBD market that is only just beginning to grow. This has implications for countries such as Morocco, which is betting on rapid and significant growth in the European market for CBD as a food supplement.

Morocco played a crucial role in the positive evolution of international legislation on *Cannabis* when the UN Commission on Narcotic Drugs (CND) voted in December 2020 to remove "cannabis and cannabis resin" from Schedule IV of the 1961 UN Single Convention on Narcotic Drugs. Indeed, Morocco, a member of the CND (unlike Lebanon), cast a crucial and strategic vote in favour of the UN rescheduling of *Cannabis* (by a majority of 27 to 25) in order to proceed with its partial legalisation of *Cannabis* cultivation, which finally happened in April 2021 when "cannabis and cannabis resin and extracts and tinctures of cannabis" were removed from Schedule IV, the stricter subset of Schedule I. As well as playing a strategic role in the partial legalisation of *Cannabis* on an international scale, Morocco has chosen a THC level three times higher than that legally used in the EU, demonstrating, if proof were needed, the country's vision and agenda.

What global legislations mean for Moroccan exports

However, given Morocco's hopes for export markets for its *Cannabis*derived products, the above factors still call for great caution in forecasting. By adopting a THC level more than three times higher than that used to designate hemp in the EU and the USA, Morocco has certainly made a scientifically and practically coherent choice, but it has considerably restricted its export market, at least for the time being, since resin and broad and full spectrum oils produced from cultigens with up to 1 % THC have to be remediated¹⁸ (down to 0.3 %) in order to be marketed in the EU (CBD isolate excluded of course).

Finally, Morocco reported in May 2024, when it had not yet formalised its rules for the local sale of CBD-rich food supplements and cosmetics, that it had adopted standards similar to those in the EU and the USA. As of May 2024, the Department of Medicines and Pharmaceuticals (DMP), one of eight departments within the Moroccan Ministry of Health and Social Protection, has reportedly registered 9 CBD-rich food supplements and 10 cosmetic products to be sold exclusively in pharmacies (before other outlets are developed). However, a meeting held at the Moroccan National Agency for the Regulation of Cannabis-Related Activities (ANRAC: Agence nationale de réglementation des activités relatives au Cannabis) in May 2024 reportedly revealed that in Morocco, in accordance with the pending EU regulations on food supplements and cosmetics, CBD-rich food supplements must contain <0.3 % THC, while CBD-rich cosmetics must be completely free of THC, meaning that only 99 % pure CBD isolate can be used in cosmetics (Kharroubi, 2024). This is despite the 1 % THC limit imposed on legally registered Moroccan Cannabis producers by Law 13-21, which leaves only inhalable products such as vapes, flowers, resin, and isolates to benefit from 1 % THC levels, provided that they can be legally sold and consumed in Morocco, which isn't yet the case (at the beginning of 2025, they could only be exported, in particular, if not exclusively, to Switzerland).

Morocco has therefore developed two sets of standards, depending on whether *Cannabis*-derived products are intended for export or for local use, with higher THC levels allowed at the production stage also being allowed at the export stage, but not at the domestic consumption stage where products must be *halal*, i.e. in accordance with Islamic teachings against the consumption of intoxicating substances (it is generally considered that a maximum of 0.3 % THC is not intoxicating¹⁹), provided also that ethanol (not *halal*) has not been used as a solvent in isolate extraction processes (contrary to most cases). Finally, Morocco does not yet allow the consumption of CBD-rich flowers and resins on its territory, although it does allow their production and export, notably to Switzerland, which also has a 1 % THC limit.

Pros and cons of the foreign cultigens and the kif landrace

While Morocco can rely on a wide variety of cultigens in the 0.3 % - 1% THC range, it is faced, like all other low-THC *Cannabis*-producing countries, with complying with THC legal thresholds for standing crops and finished products (cannabinoid and therefore THC biosynthesis tends to be enhanced by the Moroccan climate). However, complying with various international legal THC thresholds for non-recreational *Cannabis* also means that Morocco is in a situation where it cannot rely on its famed *Cannabis* landrace, called *kif* (and now overwhelmingly referred to as *beldiya*), for anything other than medical and pharmaceutical production. Indeed, while the *kif* landrace benefits from a relatively high CBD content for an intoxicant cultigen, it also suffers from a THC content that is too high to be legally cultivated in Morocco for anything other than the medical or pharmaceutical markets.

Therefore, Morocco had to resort to foreign cultigens with maximum THC levels (0.3 %-1 %) similar to those of historic hemp-producing countries such as France and Switzerland. As a result, the hashish that was exported to Switzerland after the first legal *Cannabis* harvest in 2023 was obtained from the Swiss cultigen Fenomax, which can reach CBD levels of up to 24 % with a maximum THC level of 1 % (interview with CBD hashish producer-exporter-importer A., Morocco, June 2024). This is a major paradox for a country like Morocco, one of the world's leading producer of hashish, which can be considered a terroir product and could qualify for an appellation of origin (provided it is made from the local *kif* landrace, since it is this landrace that gives Moroccan hashish part of its typicity) (Chouvy, 2023, 2024).

This is not only economically paradoxical, but also ecologically detrimental, because the *kif* landrace is logically better adapted than modern hybrids to the natural (edaphic and climatic characteristics) and cultural (cultivation techniques and selection for specific uses) environment of the Rif region, where *Cannabis* has been cultivated for centuries and where legal cultivation is now restricted. As a landrace, the *kif* cultigen is characterised not only by the high tolerance of its population (a function of its genotypic heterogeneity) to the biotic and abiotic stresses of the region, but also by its average but stable yields over time and its low input requirements.

All of this makes the *kif* landrace more ecologically suited to the Rif, as it requires much less water than the low-THC foreign cultigens. Indeed, although the Rif region benefits from Morocco's highest annual rainfall, summers are becoming increasingly hot and dry. And the relatively small leaf area (low evapotranspiration) and rapid flowering (7 to 8 weeks) of the *kif* landrace make it particularly well adapted to its natural and cultural environment, with the vast majority of cultivation traditionally carried out in rainfed fields. As for irrigation, it has historically been very rare, but it has increased over the last fifteen years to the point where the region's aquifers are increasingly at risk of depletion (Chouvy & Macfarlane, 2018, Chouvy, 2023).

While most *kif* fields are now irrigated, they still require much less water than foreign high-THC cultigens used to illegally produce hashish

¹⁸ THC remediation is the process of lowering or removing THC contents from a *Cannabis*-derived product (L'Heureux, 2020: 38).

¹⁹ In the USA, the American Halal Foundation has only certified CBD products that are completely free of THC, and has stated that CBD products with non-intoxicating levels of THC are still being researched, adding that "ethanol res-idues should be <5,000 parts per million". https://salaamgateway.com/story /us-company-launches-halal-certified-cbd-products Page consulted on 8 October 2024.

and low-THC cultigens now used to legally produce CBD-rich products. The recent partial legalisation of *Cannabis* in Morocco is therefore clearly paradoxical, as one of the country's main *Cannabis* assets, the *kif* landrace, is proving unsuitable for most of the legal markets, and the Rif's only *Cannabis* terroir product, hashish made from *kif*, cannot legally or economically compete with modern CBD-rich and low-THC hashish made from foreign cultigens. The following case study shows how the country's first legal export of hashish was produced not from *kif* but from a foreign cultigen: part of the first legal export of Moroccan hashish to Switzerland ironically came from a Swiss cultigen.

Approximately one hundred kilograms of CBD-rich and low-THC hashish produced in the Rif from the first legal *Cannabis* harvest in 2023 were exported to Switzerland (Aublanc, 2024). Forty-eight kilograms of this resin were produced in the Bab Berred area from a Fenomax crop (Swiss cultigen) grown on 2.7 hectares. Ten thousand plants per hectare and a very low 1.5 % resin extraction rate yielded a similarly low hashish yield production of 17.7 kg/ha that sold at the farm gate at a very advantageous price of \notin 1500/kg (personal communication with producer-exporter-importer A. in Morocco, July 2024).

For comparison with the illegal market, traditional high-THC hashish produced from *kif* in 2023 sold for $\leq 1400/kg$, while stronger hashish from hybrids (e.g. Gelato or Critical Kush) sold for as little as $\leq 1000/kg$ (and $\leq 800/kg$ for hashish produced from seeds saved from a previous hybrid harvest that lack hybrid vigour) (interview with producer R. in Morocco, June 2024). However, high-grade products such as low-tech (rubber glove technique in this case) static hashish (potentially 95 % trichomes and up to 75 % THC), also called full-melt hashish (because it melts completely, leaving no residue), could sell for up to $\leq 10/g$ at the farm gate (interview with producer S. and direct observation in Morocco, June 2024). Of course, it is also possible to produce static CBD hashish, with CBD levels comparable to those of THC and selling prices just as high, but the THC levels would necessarily be above the 0.3 % or 1 % thresholds.

However, the above rates and yields are low compared to what was observed during fieldwork in 2017 on a one-hectare farm producing 70 kg of resin (3.5 % resin extraction rate) from trimmed flowers of a modern, high-yielding cultigen (10,000 plants of Clementine Kush) (Chouvy & Macfarlane, 2018). The same rates and yields are higher than those typically observed in traditional hashish production from *kif* (0.14–0.44 % of dried trimmed flowers) (Clarke, 1998: 317). The yield of this first legal hashish harvest was reportedly low due to a delay in the agricultural calendar (permits were issued late), but the extraction rate was also low, as is the case for resin extracted from *kif* or Clementine Kush, as all these crops were seeded and their trimmed flowers contained up to 50 % of the weight in seeds (interview with producer S. in Morocco, July 2024; Chouvy & Macfarlane, 2018).

The CBD resin produced in 2023 in the Bab Berred area from the Fenomax cultigen was recorded as 28-30 % CBD and 0.9 % THC (personal communication from producer-exporter-importer A. in Morocco, July 2024; consultation of different certificates of analysis (COA) and of online commercial data). As this was the first time this cultigen had been grown in Morocco, the THC content was initially too high and had to be remediated. Various techniques are available to reduce THC levels if necessary. Incorporation of remediated cannabis crude oil into a resin is one such technique, often used to obtain resins with very high CBD levels (up to 55 %) and very low THC levels (0.3 % < THC). However, the final resin produced from the Fenomax crop was obtained by sieving the same flowers three times and mixing the 12 kg from the first sieve, the 28 kg from the second sieve and the 8 kg from the third sieve, each with decreasing THC levels (interview with producer-exporter-importer A. in Morocco, July 2024).

At that time, the production of hashish from a *kif* crop was illegal in Morocco and no *kif* cultivation licences had been issued for the 2023 season. But there is a future for *kif* now that Morocco has approved the cultivation of *kif* for medical and pharmaceutical purposes (high THC) in 2024, and a breeding programme for a low-THC *kif* cultigen is underway.

Conclusion: the hypothetical future of the kif landrace and the legal Moroccan Cannabis industry

It is now understood in Morocco that the *kif* landrace is very valuable and offers significant environmental and economic benefits. Therefore, in March 2024, ANRAC included it in the list of authorised cultigens (Chakir Alaoui & Mannan, 2024). The agency then quickly reported that licences for the cultivation of *beldiya* ("the local" or autochthonous) or *kif* (as it was called until the introduction of modern hybrids, initially referred to as *roumiya*²⁰ or "the foreigner" / allochthonous), had been granted to 73 production cooperatives, grouping 1225 farmers on an area of 1262 ha. According to the same agency, as of 23 April, only 903 farmers were growing *kif* on 757 hectares in the provinces of Taounate, Chefchaouen and Al Hoceima.²¹

Growing *kif* rather than modern hybrids may indeed be of interest to growers with limited water resources for irrigation and/or environmental concerns (2024 is the sixth consecutive year of drought and record high summer temperatures in the country), as well as those who lack the financial resources to purchase foreign seeds, which sell for between 20 cents and 1 euro each or €2000 to €10,000 per hectare (*kif* seeds are free as they are harvested from previous crops, but *kif* allows lower flower and resin yields) (Chouvy & Macfarlane, 2018 and interview with producer-exporter-importer A. in Morocco in July 2024).

However, due to its relatively high THC content and to Moroccan law (13–21), the *kif* harvest can currently only be sold to the pharmaceutical industry, and some Moroccan laboratories are already developing THC-based medicines from *kif*. But there is also a market abroad for THC-rich medical hashish, and some foreign entrepreneurs are already planning to export THC- and CBD-rich *kif* hashish for medical use to European countries that have legalised the medical use of cannabis (personal communication by producer-exporter-importer A. in Morocco, July 2024). *Kif* will also have a different future if current plant-breeding programmes (mainly at the Moroccan National Institute for Agricultural Research, but also in private projects) produce a low-THC *kif* cultigen, as it is thought possible to reduce the THC content of *kif* to below 0.3 % (interview with David Watson,²² July 2024).

To achieve this while preserving the landrace status of *kif*, the option would be to opt for phenotyping (interview with David Watson), but this would mean obtaining a new landrace according to a rather modern and comprehensive definition of landraces proposed by Casañas et al. (2017). The resulting new landrace would most likely retain the high tolerance of the original *kif* landrace to the biotic and abiotic stresses of the Rif region, and perhaps its organoleptic qualities, but it could no longer be legitimately used as a source of the terroir product that is traditional Moroccan hashish (hashish that had average CBD and THC levels of 6.3 % and 7.9 % in the 1970s and 1980s, according to data collected by Robert Clarke (Clarke, 1998: 362)).

Morocco's legalisation of *Cannabis* is a particularly interesting case study, given that it is one of the world's largest producers of hashish, and therefore one of the world's largest producers of *Cannabis*. Morocco has chosen to legislate in a way that allows a degree of flexibility by not restricting itself to hemp, which it neither mentions nor defines as such,

²⁰ For a product to be called *roumi*, it must have a *beldi* counterpart, and vice versa (Simenel, 2010: 168). See also Rachik, 1997, and Chouvy, 2022.

²¹ "Cannabis légal: 2.905 autorisations délivrées en 2024 (ANRAC)", 25 April 2024, H24Info.ma, https://www.h24info.ma/cannabis-legal-2-905-autorisat ions-delivrees-en-2024-anrac/

²² Alias Sam the Skunkman (passed away in January 2025), breeder of the Skunk #1 hybrid (1976) and, with Robert Clarke and others, of the first low-THC (0.2%<THC) high-CBD cultigen (1996-1998) that was used by GW Pharmaceuticals to produce their Sativex (CBD:THC ratio 1:1) and Epidiolex (CBD only) cannabis medicines (personal communications, July and August 2024).

and by allowing different cultigens for certain uses. By distinguishing between crops and products with a THC content below and above 1 %, Morocco has strategically opted for the upper limit of what the rest of the world calls hemp, without now prohibiting the cultivation of its autochthonous landrace,²³ which has a THC content well above 1 %. Also, by not setting a THC ratio limit for the production of medical and pharmaceutical Cannabis derivatives, Morocco has strategically kept the field of possibilities wide open, and high-THC (up to 70 % for the time being) Moroccan hashish and other derivatives (such as rosin, a highly concentrated resinous oil obtained by hot press) made from the kif landrace will be sold in Swiss pharmacies by 2025 (interview with producer-exporter-importer). Morocco also seems to want to develop a low-THC variety of its landrace (producing a type 3 chemovar from what is essentially a type 2 chemovar, i.e. one characterised by similar THC and CBD levels) in order to no longer depend on imports of foreign cultigens and also to make its Cannabis industry as environmentally sustainable as possible in the current climate.

However, the Moroccan legal *Cannabis* industry is not without its challenges as it will now have to face the structuring of its national market, which is still non-existent and seems to be limited by a THC content lower than that allowed for production; and the development of a global market characterised by a great diversity and complexity of rules, but also, in all likelihood, favourable to local production and pharmaceutical independence.

Finally, countries such as France, which have a large CBD consumer market but little or no production, may eventually develop their production capacity, which is currently limited mainly by restrictive and often unclear and fluctuating legislation. As for countries such as Morocco, which have significant production capacity but lack a local consumer market, they will need to develop such a market, which is still non-existent or, at best, nascent. Indeed, the future of the CBD and other cannabinoid industries is likely to be local rather than global, with producers and governments in some countries calling for protectionist measures, particularly anti-dumping measures (Australia and Israel are particularly concerned about imports from Canada, which is a major exporter but restricts imports).

Also, the future of the phytocannabinoid industry is necessarily linked to that of the pharmaceutical and food industries, which have been the focus of global calls for strategic independence and repatriation of production facilities, especially since the stock-outs observed during the COVID-19 pandemic. This is the thrust of the 2020 Pharmaceutical Strategy for Europe, one of the objectives of which is to improve the security of pharmaceutical supply. The future of Morocco's cannabis industry will then ultimately depend on a combination of factors, including changes in national legislation, national agricultural strategies and capacity, the degree of protectionism in trade policies, and even climate change.

CRediT authorship contribution statement

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Declaration of competing interest

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

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²³ Curiously, however, given how widespread the cultivation of foreign hybrids already is in the country, Morocco strictly prohibits "all imports of seeds and plants derived from cannabis varieties identified by ANRAC as 'landraces'", officially in order to "protect the national heritage" (ANRAC, 2022, article 5).

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