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Why the concept of terroir matters for drug cannabis production.

Pierre-Arnaud Chouvy

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Abstract:

This article questions how the concepts of terroir and landrace are relevant for the drug cannabis industry at a time when cannabis legalisation and its associated “green rush” pose a growing threat to both the genetic and cultural diversity that is associated with historical small cannabis farming. The article draws on a multidisciplinary approach based on both extensive secondary sources and primary research. A large and detailed definition work first informs what terroir and landrace are and most especially what they have in common, from the typicality of their end products, to how they owe their existence to geographic remoteness and isolation, and to how tradition and change (or modernity) affect their development and conservation. Defining and connecting terroirs and landraces in historical, anthropological, environmental, and of course chemical terms, makes it possible to determine how cannabis terroirs compare with and differ from other terroirs and plants, based on the rare dual qualities of the plant (being both a food and a drug) but also, given the illegality of its cultivation, on the specific territorial characteristics of its production areas, notably their geographic remoteness and isolation, their politico-territorial control deficits, etc. The article concludes that acknowledging and protecting cannabis terroirs and landraces matters because it favours the conservation and the promotion of a biological, cultural, and sensorial diversity that has endured illegality and repression but is now threatened by legalisation.

Keywords: cannabis, terroir, landrace, typicality, tradition, illegality, legalisation

Introduction

Due to its high phenotypic plasticity¹, drug cannabis (*Cannabis sativa* L.), also informally known as marijuana, can be grown outdoors almost anywhere between 50° north and south. Yet, while drug cannabis is actually grown all over the world, large-scale commercial cultivation of drug cannabis² has historically been circumscribed to a few areas in the world, due largely to the constraints posed by the international drug control regime (see Chouvy, 2019b, for a detailed description and explanation). As a result, cannabis main end products (herbal cannabis and hashish) have historically been exported regionally or globally, out of their limited production areas in Africa, Asia, and Latin America, to markets in the Global North (see, for historical geographies of cannabis: Warf, 2014; Duvall, 2014; Chouvy, 2019b). Then, starting in the 1960s, cannabis cultivation progressively developed both indoors and outdoors in both North America and Western Europe, thanks notably to the breeding of high-yielding hybrids. Lately, starting in the 2000s, a fast-growing global market and the worldwide success of modern hybrids, most recently facilitated by a growing legalisation global trend, has put landraces, traditional productions, and, consequently, terroirs, at risk (Chouvy, 2019b; Chouvy, 2020).

In this context, much of the policy debate on legislation changes in the Global North, especially in Canada and the United States, has focused on the impact that the legalisation of cannabis might have on its societies and economies, in terms of impact on the illegal trade and its associated violence and costs, but also in terms of new tax sources. But there has been little to no discussion on how changes in cannabis legislation in the Global North might affect the socio-economic and political conditions in producing countries of the Global South, where historic cannabis growing communities are likely to suffer from the higher productivity and industrial scale of intensive cannabis cultivation that is fast developing worldwide (Chouvy, 2019b). In fact, as explained by Duvall, “current instances of cannabis liberalization in Africa epitomize neo-colonialism” as “foreign capital is being used to exploit the continent’s resources

¹ Which is “the ability of individual genotypes to alter their growth and development in response to changes in environmental factors” (Barret, 1982, quoted in Small, 2015: 199).

² This article is about drug (psychoactive) cannabis, not non-drug cannabis (“hemp” of fibre cannabis) or the fast emerging medicinal uses of psychoactive cannabis.

– land, water, labor, and cannabis – rather than to offer meaningful opportunities for Africans to accumulate wealth” (Duvall, 2019: §34, 36).

Indeed, the future of the world’s varied cannabis industries is very uncertain as the ongoing farming and legislative changes are already affecting the old structures of the global, regional and national markets. New North-South, but also North-North and South-South dynamics are emerging in response to the increasing number of countries and states that are legalising recreational and/or medical cannabis. Also, the recent adoption of modern high-yielding varieties and farming techniques is already impacting the global map of cannabis cultivation, with economic, socio-political, and environmental consequences that must not be ignored (Chouvy, 2019b).

In this context, the interest for both cannabis terroirs and landraces is growing fast but not without confusion. Landrace seeds have gained in popularity and breeders and “strain hunters”³ have been commercializing them alongside a vast offer of hybrid seeds. And, while bioprospectors have long been looking for landraces of various plants, cannabis has also become the target of a worldwide quest for famed but often fast-disappearing landraces (Duvall, 2016). However, while cannabis landraces from Africa, Asia, and Latin America have become very popular and are being heavily marketed in Europe and North America, cannabis terroirs have not yet received as much attention⁴.

It is important, therefore, to clarify what cannabis terroirs and landraces are. Prior to the more exhaustive definitions that will follow, let us say in simple terms that terroir is a complex concept according to which the typicity of a product is determined by both its natural and cultural environments, and that a landrace is a domesticated variety of a plant (or animal) species that, due to isolation, has adapted to its natural and cultural environments. In more complex terms, one can say that a terroir is the expression of how non-genetic factors, such as

³ To clarify the terminology: variety refers to a taxonomic rank while cultivar is a registered cultivated variety defined by a stable phenotype. As for strain (widely mentioned in the cannabis industry), it is a term used in microbiology that is without any official meaning in botany (although it is often used to refer to the group of offspring from a modified plant). In the end, the best way to globally refer to the different cannabis varieties and cultivars, including the so-called strains, is by speaking of cultigens, that is, “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.*, 2009: 1). As a consequence, we can say that if all cultivars are cultigens (they are cultivated), not all cultigens are cultivars (because not all cultigens have been formally named and catalogued as cultivars). The landraces with which we are concerned hereafter cannot be considered varieties, or cultivars, much less strains, but they are clearly cultigens.

⁴ I would like to acknowledge here the late Frenchy Cannoli (1956-2021), who was not only a master hashishin and a well-known cannabis activist, but was also the most fervent advocate of a terroir-based approach of cannabis production. See <https://www.nytimes.com/2021/07/31/us/frenchy-cannoli-dead.html>.

environmental and cultural factors, impact the genotype as well as the phenotypic plasticity of a given cultivar, most especially, in the long run, a landrace.

Both terroirs and landraces are very geographically and historically determined. This is why they should ideally be considered together, not only for the sake of biodiversity and cultural diversity, but also as a way to preserve the livelihoods of some the world's poorest farmers. Indeed, cannabis growers worldwide have long suffered and benefited from the illegality of cannabis (burden but also opportunity cost of prohibition). And cannabis landraces and terroirs have also suffered and benefited from cannabis being illegal (repressive policies – including forced eradication – but also protection from the early shift toward intensive agriculture). Yet, growers, along with their landraces and terroirs, now face a risk of genetic and cultural erosions due to the intensive agriculture model (Negri *et al.*, 2009) made possible by the ongoing global legalisation process.

This article therefore questions how the concepts of terroir and landrace are relevant for the cannabis plant at a time when cannabis legalisation, its associated “green rush”, and the fast development of large cannabis companies, pose a threat to both genetic and cultural diversity and to small cannabis farming and craft cannabis, that is, to relatively small, independently and/or family owned commercial farms and “grows” where artisanal rather than industrial/mass producing methods are used (Stoa, 2018; Thompson, 2018).

To address these issues, this article first provides a much-needed definition of each concept, both in generic and cannabis-specific terms. Looking at cannabis through the double lens of terroirs and landraces obviously raises many questions as the concepts themselves are often poorly understood and remain controversial even when it comes to legal crops and products, but also because scientific research about cannabis has long been hindered by the illegality of the plant and its by-products (Chouvy, 2019a). The plant itself is the subject of many controversies and debates, regarding its (il)legality, its dual food and drug status, its therapeutic and/or recreational uses as a drug, and even its taxonomic status.

More specifically, this article questions the very existence of cannabis terroirs, how can they be defined and delimited, how the abiotic, biotic, and even cultural dimensions of terroirs can affect the chemical profiles of cannabis, and why and how cannabis terroirs and landraces are linked, notably in terms of typicity but also of “tradition” and modernity/change⁵. The article

⁵ Let us acknowledge that tradition and modernity constitute an “obsolete dichotomy” in that they are “not polar opposites in a linear theory of social change”, or steps on a ladder to economic development (Gusfield, 1967;

eventually, and necessarily, explains what cannabis terroirs and landraces owe to illegality, geographic isolation and remoteness, as well as deficits of politico-territorial control.

The size and diversity of the literature related to terroirs and landraces, not mentioning cannabis, obviously made a systematic literature review impossible and rather called for an integrative review approach that produced a “creative collection of data” in order to “combine perspectives and insights from different fields or research traditions” (Snyder, 2019: 334). Indeed, studying such a complex subject based on such complex and often controversial objects (cannabis, landraces, terroirs) required resorting to a multidisciplinary approach and, as a consequence, to a wide-ranging literature from multiple disciplines. Articles were selected (and excluded) according to the aforementioned research questions and objects, and more specifically to how studies focusing on crops other than cannabis could be made relevant to cannabis (role of secondary metabolites, inclusion of both food and drug crops, etc.). Also, the most recent work was favoured as discoveries are regularly made on, for example, plant metabolism or the influence of soils on the chemical makeup of plants. Yet, this article also owes to years of personal fieldwork and research carried on the illegal cultivation of drug cannabis, especially in Morocco and in India, specifically on the ongoing modernisation of cannabis cultivation and production, and on the threats posed to cannabis terroirs and landraces.

What terroir first meant

The etymology and history of the term terroir matter because terroir is too often thought to be a thing from the past, embedded in tradition, when it is actually a modern concept that can be applied to rather recent productions, such as Californian marijuana production and Moroccan hashish production. The word terroir is a Gallicism, a French loanword. It appeared in French in 1246 by refashioning *tieroir* (1212). It is commonly thought to be derived from the popular Latin *terratorium* (that gave the French word *terre* (Latin *terra*), that is, earth or land in English), a Gallo-Roman alteration of classical Latin *territorium* that eventually gave the French *territoire* (territory) (Bérard, Marchenay, 1995). As such, the word terroir evokes the soil or the earth, but also the land and the territory. Being polysemous from the start, terroir has not always been properly understood or used, including in French where its exact meaning has varied historically (Vaudour, 2002; Spielmann & Gélinas-Chebat, 2012).

Germond-Duret, 2016). Here, the focus is on change vs. conservation, and the word tradition will be used in a non-fixist manner.

In French, *terroir* first (13th century) referred to an agricultural territory delimited administratively and politically, based on the notion of *territorium*, that is, the land or district lying around a city or town (Leturcq, 2020: 25; Tounta, 2014: 146). From its first appearance and throughout Medieval times, *terroir* therefore referred more to agricultural land conceived administratively than agronomically. In fact, *terroir* was not used to refer to an agricultural land considered in terms of its agronomic qualities and potential before the early seventeenth century: it is commonly agreed that such a meaning was first devised in 1601 by French agronomist⁶ and humanist Olivier de Serres, (Rouvellac, 2013: 14; Boulaine, 2000: 12).

Yet, *terroir* was then often considered pejoratively, for it was understood to confer a “stink from the earth” (*vis terrenum*), a rusticity, a crudeness to agricultural products. The notion of *terroir* only took a positive meaning in the eighteenth century with the French revaluation of provincial life and its gastronomy (Leturcq, 2020: 26). However, the concept did not develop scientifically before the nineteenth century and the emergence of pedology and the subsequent notion of soil vocation (Bérard, Marchenay, 1995). The term has meant very different things throughout history and as a result it is still often used inaccurately and anhistorically, including in French, whether in a fixist way (assuming that what *terroir* means has been consistent throughout history), an anachronistic way (mixing modern and old meanings of *terroir*), or an essentialist way (presenting the *terroir* as an evidence, an ontological necessity) (Leturcq, 2020: 24). As we will see later, this matters because recognising the existence of cannabis *terroirs* and other “new *terroirs*” is possible once the modernity of the concept of *terroir* is understood and acknowledged. Therefore, contrary to what is often assumed, “proving and promoting the connection to *terroir*” is also possible for agricultural producers from “countries with newer and more heterogeneous food cultures”, that is, countries such as the United States, Canada, Australia, etc. (for the vast majority of the world’s food cultures has more historical depth) (Trubek, Bowen, 2008: 27). As is too often ignored, *terroir* is not as much about history as it is about typicity and, therefore, de-commoditisation of products and tastes (Lotti, 2010; Daviron, Vagneron, 2011).

Despite or maybe because of its blurred meaning, the concept of *terroir* has proven increasingly popular worldwide (Bérard, Marchenay, 1995; Pitte, 1999; Barham, 2003; Casabianca *et al.*, 2006; Trubek, 2009; Demossier, 2011; Delfosse, 2012; Prévost *et al.*, 2014;

⁶ Or “agricultural land manager” as it was then called since “agronomy” only appeared in the mid-eighteenth century.

Zheng, 2019). Indeed, while the terroir concept is said to have developed over centuries⁷ of winemaking in France, it has recently been applied to many agricultural productions throughout the world (tea, wheat, barley, whisky, cheese, ham, maple syrup, etc.), including, at least tentatively, cannabis since the mid-2010s in California (Cannoli, 2015; Sweeney, 2016). Yet, the word has never been adequately translated in English or in other languages, for various reasons.

As a result, the word itself is frequently used as such in English, despite more or less successful translation attempts in coining words or expressions meant to be self-explanatory. Yet, referring to words or expressions as evocative and descriptive as “somewhereness” (Kramer, 1990), “placeness” (Jefford, 2002, after a broader concept first proposed by Relph, 1976), or “taste of the place”⁸ (Trubek, 2009: 2), has not dispensed with providing a definition complex enough to match the complexity of the underlying concept. Coining different words to refer to a given concept merely added synonymy to polysemy, without succeeding in turning these words into terms, that is, “signs closely linked to a specialized conceptual content” (Ali Khan, 2016: 697). With terroir as with other terms, the use of neologisms just could not bridge the conceptual gap that exists when “the concept is not new and on the contrary well-established in the source context but is nevertheless unfamiliar in the target context” (Buyschaert & László, 2017: 8). This matters all the most because, as we will see, the problem is less about language and word choice than about the definition of a concept. As a result, the use of the Gallicism terroir has been widespread in English since the 1990s because no calque (or loan translation: literal word-for-word translation) was possible and because all attempts at neologisms proved rather unconvincing and only added more confusion.

What terroir has come to mean

According to its most simple modern definition, based on French dictionaries, a terroir is a delimited land (more than a place or area) considered in terms of its agricultural suitability. This is actually very restrictive as a terroir is much more than just “an area or terrain, usually rather small, whose soil and microclimate impart distinctive qualities to food products”, as it is too often defined (Barham, 2003: 131). Indeed, terroir is more about landness (and the resulting

⁷ Despite common belief, there is no historical evidence that Cistercian monks from Burgundy delimited “terroirs” (the notion of *climats* does not really take hold before the late seventeenth century). The alleged role of the Cistercian monks in defining terroirs will be put forward only in the 1920s in the context of the emerging wine folklore (Garcia, 2020: 144). In fact, it does not seem that location or soil quality were qualifying criteria of wines before the mid-eighteenth century (Garcia, 2014; Labbé, 2011).

⁸ Actually a translation of *gôût du terroir*, or taste of terroir/place, rather than of *terroir*.

landscape) than about placeness or somewhere-ness, even etymologically, although no occurrence of landness could be found in the literature.

In fact, according to its most comprehensive scientific definition to date, such as the one elaborated by Casabianca *et al.* (2006: 3), “a terroir is (1) a delimited geographical area (2) where a human community (3) builds over the course of its history a collective knowledge of production (4) based on a system of interactions between a physical and biological environment, and a set of human factors. (5) The socio-technical processes thus brought into play (6) reveal an originality, (7) confer a typicality, (8) and result in a reputation (9) for a good originating from that geographical area” (my translation).

As such, a terroir is not defined by an agriculture type but by terroir products whose typicality is linked to a geographic origin and history that can be established, traced back and, provided that a label exists, guaranteed. At this stage, origin and provenance must be distinguished for a product coming from a given place (provenance) is not necessarily a product originating from that place (origin) (Bérard & Marchenay, 2008: 10), as is often the case in the United States (with maple syrup for example) (Trubek, Bowen, 2008; Trubek, 2009). In the case of cannabis, hashish of Moroccan origin (local cannabis variety and sieving technique) must now compete with hashish of Moroccan provenance (modern hybrids and modern production techniques) (Chouvy & Macfarlane, 2018). Therefore, according to the definition above, only hashish of Moroccan origin can be considered a terroir product.

Indeed, as elaborated by Casabianca *et al.* (2006), a terroir is not immanent, it does not exist on its own or naturally. It is the result of a construction carried out in a certain milieu by a specific human community. A terroir is necessarily associated to a know-how, a collective knowledge that is not innate but results from an evolving process of accumulation of individual and collective experiences over time. A terroir is therefore clearly inscribed in a historical and cultural process that is always in the making, through continuous innovations. As such, a terroir is also not the result of an explicit and intentional project: it is rather an emergent property issued from the activity of a human community. This makes terroir the product of a collective cultural heritage, that is, of the cultural knowledge of a given society or social group, often that of a peasantry. In that sense, a terroir results from a system of interactions between environmental factors (soil, climate, topography, hydrography, flora, fauna, micro-organisms, etc.) and human factors (economic, social, political, and cultural characteristics, crop cultivation and livestock production systems, production practices and techniques, skills, etc.). As a

consequence, a terroir produces goods that range from products (terroir products) to, quite logically, agroecosystems, landscapes, and environments.

There is obviously no terroir without terroir products and therefore without typicity, that is, without product conformity to an established type. Typicity is a fundamental concept of the modern acceptance of terroir because while typicity can exist outside of a terroir, no terroir can exist without typicity. The term *typicité* was first mentioned in a French dictionary in 1993 to refer to the global characteristics of a given wine, twenty years after it was apparently first coined on the basis of “type” (understood as the set of common characteristics of something) and “typical” by INAO⁹ agents who wrote that “a wine will be considered typical when it closely resembles the empirically defined type” (Vedel *et al.*, 1972, quoted in Casabianca *et al.*, 2006: 4).

As a result, typicity is the key notion that underlies the concept of terroir and as such it must be properly and precisely defined: “the typicity of an agricultural product refers to its property of belonging to a type, which is distinguished and identified by a reference human group whose types of knowledge are distributed among the different actors of the agricultural sector: knowledge to establish, knowledge to produce, knowledge to evaluate, knowledge to appreciate” (Casabianca *et al.*, 2006: 5 - my translation). Yet, typicity “should not be confused with the conformity to a standard”, including that of a branded product: a terroir product is the opposite of a standardised product as it implies variations within the type. As such, it also clearly differs from a brand. As was aptly told to Trubek (2009: 250) by a sommelier, “Terroir is character. It is the triumph of diversity over homogeneity.”

While legalisation and large-scale intensive cannabis farming are developing rapidly in the world and tend to favour homogeneity (and commoditisation) over diversity, there still remains a large diversity of traditional cannabis end products throughout the world, especially in the Global South where national productions differ greatly from each other (Chouvy, 2019b). Cannabis end products have always been very easily distinguished based on their nature (sieved or hand-rubbed hashish vs herbal cannabis), their character and their typicity (aspect, taste, aroma, effects), depending on their geographic origin, varietal origin (if typicity reveals terroirs, then the most unique terroirs are those whose products are issued from an autochthonous landrace: see below), and the socio-technical processes involved. A great diversity actually

⁹ *Institut national de l'origine et de la qualité*, the French official institution responsible for the implementation of “the French policy on official signs of identification of the origin and quality of agricultural and food products”.

exists within certain countries, such as in Afghanistan (sieved hashish) and India (hand-rubbed hashish), where a variety of regional and sub-regional products enjoy a wide reputation, even on a global scale. By contrast, in other producing countries, such as in Lebanon or Morocco, two famed producers of sieved hashish, there could well be only one terroir (Bekaa Valley and Rif). The same is likely to be true of traditional producers of herbal cannabis, with a varying diversity of terroirs the world over.

According to the definitions above, many potential – yet undefined and undelimited – cannabis terroirs come to mind, notably in Afghanistan, India, Morocco, Jamaica, Colombia and Mexico, Malawi, and South Africa. Indeed, most of the world’s cannabis has long been produced in limited geographical areas (small cultivated areas), by specific human communities, according to their historically constituted collective knowledge of production (various cultivation techniques, various hash-making and herbal cannabis processing techniques), at the interface between a physical and a biological environment. As a result, many of the world’s traditional cannabis products, be they of the hashish type or of the herbal type, have been distinguished and have enjoyed a reputation, often the world over, based on their originality and their typicity. Yet, the typicity of cannabis end products differs from that of many other crops as it is not only determined in terms of taste, aroma, aspect, and product type (with an impact on the methods of consumption), but also, since we are concerned with drug cannabis, in terms of effects (type and strength) (Chouvy, 2022).

Determining which of the cannabis production areas deserve to be called terroirs and how to accurately delimitate these terroirs is no small task and typicity might actually be the key. Since there are no terroirs without terroir products (determined by their originality, their typicity, and their reputation), it seems that the easiest and most logical process to identify and circumscribe cannabis terroirs would be according to the originality, the typicity, and the reputation of cannabis end products, but also on the basis of the biological and societal factors that made such original and typical products environmentally, technically, and historically possible. In fact, starting from the typicity of a given end product and from the knowledge that must apply to it (knowledge to establish, knowledge to produce, knowledge to evaluate, knowledge to appreciate) can help distinguish between terroirs and regular agroecosystems¹⁰: no terroir can exist – and by extension be found – outside of an existing societal knowledge.

¹⁰ An agroecosystem is “a biological and natural resource system managed by humans for the primary purpose of producing food as well as other socially valuable nonfood products and environmental services.” (Wood *et al.*, 2000: 24)

Since there is no terroir without terroir products, newly found/recognised terroirs should first be designated and delimited not from the ground up, but from the product down. Therefore, while new terroirs can be designated and delimited throughout the world, independently of their historical depth (not so speak of tradition or authenticity) but not independently of the previous existence of terroir products defined by their specificity: it is not the locality that makes a terroir product, it is its specificity (even if the latter is determined by local factors and, in the end, place) and, before that, its reputation. Despite what some may wish in the cannabis industry, recognising a place of origin is not a sufficient criterion to designate new cannabis terroirs, as is well acknowledged by the strict French AOC label that is somehow antithetic to the dominant worldwide commoditisation of agricultural products (Augustin-Jean *et al.*, 2012; Stoa, 2017).

An AOC, or “appellation d’origine contrôlée” (appellation of controlled origin), is closely related to the European Union’s Protected Designation of Origin (PDO), and has no equivalent either in North America or at the world level. As explained by Bérard and Marchenay (2008: 14), “The philosophy behind PDO regulation is to protect, by means of a name, a unique product that cannot be reproduced in any other place. Production must be wholly confined to a specific geographical area and the product’s characteristics must be demonstrably connected with and influenced by that area”. We can clearly understand, therefore, that an AOC or a PDO product is not solely a product whose geographic origin is ascertained: it is a product whose specificity and typicity is determined by a given place of origin (not only provenance) and as a consequence AOC/PDO products are far from only be local products. Therefore, AOC/PDO products, very much like the terroir products they are essentially related to, differ very much from regular commodities, or from branded products for that matter.

Yet, it must be acknowledged that there exists a rather universal “tension between the commoditization and singularization of products” (Lotti, 2010: 73) and that even terroir products can be turned into commodities once they have “moved from the sphere of the singularly worthless to that of the expensive singular” (Kopytoff, 1986: 80). Terroir products, especially when subjected to labels and marketing strategies, tend to become commodities despite being products identified for their singular characteristics (Lotti, 2010: 81). In the end, there are degrees of commoditisation and one should focus more, as Igor Kopytoff and Arjun Appadurai have explained, on the “social life of things” than on things themselves, since “the flow of commodities in any given situation is a shifting compromise between socially regulated paths and competitively inspired diversions” (Appadurai, 1986: 17). In the end, “shifts and differences in whether and when a thing is a commodity reveal a moral economy that stands

behind the objective economy of visible transactions” (Kopytoff, 1986: 64) and accepting or refusing labels such as AOC and DPO does just that, revealing a moral economy.

As a matter of fact, the label issue is very dependent on local legislations and regulations, whether they are national (France), federal (USA), supranational (EU), or international (WTO). Much of the debate that opposes different legislative and regulatory views is based on how quality is perceived and defined, whether it is according to the Fordist-based approach of standardisation and consistency (norms, as in branded and commoditised – or fungible – products) or that of differentiation/ singularisation (typicity, as in terroir products) (Augustin-Jean *et al.*, 2012). To put it simply, terroir products are conducive to labels but labels are not needed for commoditised products that are either marketed in bulk or by way of brands (standardised products). Here the economic competition is shaped by opposing cultural values and conceptions of quality. As a result, terroir products and geographical indications systems are seen as threats to branded products and “the countries which are ‘friends’ of the *sui generis* geographical indications system (mainly in Europe) are struggling to create an international notification system, while others (North America, Australia and so on) do promote brands or collective marks” (Augustin-Jean *et al.*, 2012: 6). While this article is about terroir and landraces, not about labels and commoditisation, it was nevertheless important to mention the subject briefly as terroir products eventually largely depend on labels if they are to be marketed outside of their limited cultural regions of origin.

Terroir and the chemical makeup of plants

Terroir is known to determine typicity and to impart taste and aroma in those agricultural products meant for human consumption that trigger the gustatory and olfactory systems. But cannabis can be defined not only in the matter of taste and aroma but also in the matter of effects. In that regard, cannabis can be compared to other plant-based products, such as coffee and tea, whose aroma, taste, and effects (caffeine contents) are to some extent determined by the environment through phenotypic plasticity. It is now widely accepted that the chemical fingerprint and quality of wine (the first acknowledged terroir product ever), but also hops, coffee, tea, cacao, cannabis, etc., can be affected by soil properties and other factors: this is what Bauer *et al.* have referred to as the “sensory impact of terroir” after demonstrating that terroir was “a true source of authenticity and typicality of wine” (Bauer *et al.*, 2011; Muñoz *et al.*, 2019; Beans, 2020; Kumpf, 2020; Lembo *et al.*, 2020).

It is often postulated in the cannabis industry and amateur/commercial literature that terroir modifies the effects and the strength of cannabis by influencing the plant's chemical makeup. This is the case, for example, of Swami Chaitanya, co-founder of an eponym brand (Swami Select) of “organic sun-grown cannabis” in Northern California’s “Emerald Triangle”, who maintains (in a restrictive acceptance of terroir) that “terroir encompasses all the qualities of the region in which cannabis grows that contribute to the density, flavor, terpene and cannabinoid profile of the bud”¹¹, and that “the nutrients present in the soil and hours and intensity of sunlight affect terpene profiles.” Chaitanya claims that “this is demonstrated¹² by the fact that indoor factory-grown cannabis rarely has the terpene saturation that long-season sun-grown flowers have” (Stone, 2019). Yet, further evidence is still required to back up such claims because a better “understanding of how fertilization affects the production of different types of secondary plant metabolite contents” is still needed¹³. But it is nevertheless now widely accepted that while “terpenoid biosynthesis is known to be under strong genetic control” and to be “little influenced by abiotic factors”, there is evidence that “some degrees of phenotypic plasticity can be observed in terpene production as a response to abiotic factors” and, in some case, to soil fertilisation (Bustamante *et al.*, 2020).

Considering coffee and tea can actually help us better understand cannabis as the three plants are sources of drugs whose effects are produced by secondary metabolites, such as caffeine, THC, and various terpenes. For instance, caffeine and terpene levels in tea have been shown to be subject to various environmental factors as multiple studies have indicated that climate change had effects not only on crop yields but also on crop quality: “findings provide evidence that shifts in seasonality, water stress, geography, light factors, altitude, herbivory and microbes, temperature, and soil factors that are linked to climate change can result in both increases and decreases up to 50% in secondary metabolites”(Ahmed *et al.*, 2019). As a matter of fact, it has also been shown that “higher concentrations of atmospheric carbon dioxide affect

¹¹ Cannabinoids and terpenes are secondary metabolites. The most prevalent cannabinoids of the at least 113 cannabinoids identified in cannabis are tetrahydrocannabinol (THC), cannabidiol (CBD), and cannabinol (CBN). Cannabinoids are known to have many psychotropic and pharmacological effects. As for terpenes, they are “responsible for the flavor of the different varieties of cannabis and determine the preference of the cannabis users” but “pharmacological effects have been detected for some cannabis terpenes and they may synergize the effects of the cannabinoids” (Flores-Sanchez & Verpoorte, 2008: 616, 627). In any case, terpenes contained in both cannabis and hops have been shown to “exhibit antibiotic, anti-inflammatory, anti-oxidant, anti-cancer and anti-tumor activities” (Nuutinen, 2018: 220).

¹² It is actually more suggested than formally demonstrated as scientific evidence is still lacking.

¹³ The results of various studies that have analysed the relationship between leaf terpenoid concentrations and nutrient availability have largely proven contradictory.

crops in two important ways: they boost crop yields by increasing the rate of photosynthesis, which spurs growth, and they reduce the amount of water crops lose through transpiration.”¹⁴

Even though the metabolism of the coffee and cannabis plants (amongst other plants) is not yet fully explained and understood, it is clear that the biophysical dimensions of terroirs have effects on the chemical makeup of perennial and annual crops alike, including cannabis. In fact, while the concentrations of compounds in cannabis clearly “depend on tissue type, age, variety, growth conditions (nutrition, humidity and light levels), harvest time and storage conditions”, there is also evidence that “the production of cannabinoids increases in plants under stress”, and that other “ecological interactions” exist (Flores-Sanchez & Verpoorte, 2008: 616).

If anything, as is amply indicated by the adaptation of landraces to specific environments (see below), the biophysical and social parameters of local environments have effects on cultivated crops. Indeed, as has been demonstrated by numerous studies, “plants have a striking ability to evolve and adapt to different environment conditions with a phenotypic plasticity associated with physiology and metabolism changes” and, as studies about coffee have shown, “genotype or environment influences can be captured by phenotypic or transcriptional profiling during coffee bean development” (Cheng, 2016: 28).

Caffeine, THC, CBD, and CBN are secondary metabolites (like all cannabinoids and terpenoids), active compounds that partly define crop quality and are part of the defence mechanisms of plants against herbivores, pests, and pathogens (Flores-Sanchez & Verpoorte, 2008: 616). Therefore, THC in cannabis, and caffeine in coffee and tea plants, protect them from pests, fungi and microbial infection, and deter herbivores (Clemensen, 2018: v). As a consequence, and as has been shown with hops (aptly, a member of the Cannabaceae family, like cannabis), an increase in pest or herbivory pressure can increase the production of a plant’s chemicals (specifically hexyl glucoside, one of hop’s aroma glucosides, also secondary metabolites) (Morcol *et al.*, 2020).

In a holistic terroir-based approach it is interesting to note that “extensive research has investigated herbivore-induced responses in plants [...], which appear to have much greater influence on fluctuations in PSM concentrations than planting configuration or fertilization”

¹⁴ “NASA Study: Rising Carbon Dioxide Levels Will Help and Hurt Crops”, Samson Reiny, 3 May 2016, <https://www.nasa.gov/feature/goddard/2016/nasa-study-rising-carbon-dioxide-levels-will-help-and-hurt-crops> (page visited on 6 January 2022).

(Clemensen, 2018: 145). The biotic dimension of terroirs, which can depend on human activities or even magical and religious beliefs, is therefore likely to be of importance (as shown by the role played by microorganisms in plant growth phytohormone production, and sustainable agricultural production), not only in terms of agriculture but also in terms of environmental conservation (Rashid *et al.*, 2019).

While cannabis obviously differs very much from vines and wines (both as plant and an end product), it is still interesting to compare them as their respective aroma and flavour depend on their terpene profiles. Therefore, the research conducted by Bauer *et al.* on Riesling wine in Germany raises questions about cannabis and how geographical origin and terroir matter (what, exactly, makes hashish “Moroccan” for example?). Indeed, Bauer *et al.* have determined that “soil type is one of the most dominant influences on aroma and flavor” after they demonstrated that “the flavors of wines made from similar soils but far apart geographically had more in common than wines made from different soil types that were located close together”, regardless of different vintages and of winemaking processes (Brooks, 2020; Bauer *et al.*, 2011). This seems to be corroborated by an ongoing comparative experimental research conducted on cannabis by geologist John Bershaw. His preliminary findings tend to show that soil chemistry has a significant effect on cannabis chemistry, as three clones of two different cannabis cultivars grown in five soils of Southern Oregon (USA) were “analysed for cannabinoid and terpene concentrations, as well as levels of macronutrients (nitrogen, phosphorus, potassium, calcium, sulphur and magnesium) and trace minerals (such as iron, manganese, boron, copper, iodine and zinc)” (Nowak, 2020).

Research on plants other than cannabis and vines has also shown that water quality but also water source affect soil and crop productivity, that is, not only when crops are irrigated with polluted water but also when waste water (high concentrations in heavy metals, salt, etc.) or underground water is preferred to rain water: various empirical works have indicated that rainfed crops showed higher yields than crops irrigated with waste or even underground water (Okorogbona *et al.*, 2018). Here again, this raises questions about cannabis when, as is the case in Morocco, rainfed cultivation of autochthonous landraces is being replaced by irrigated production (even more so when farmers switch from landraces to modern hybrids and when indoor cultivation is concerned).

The aforementioned importance of the biophysical environment does not mean, however, that human factors are insignificant. It is actually far from being the case, as soils and water are selected (location, crop choices, water source and use), worked (farming inputs,

tillage techniques, irrigation choices) and managed (crop rotation, fallow periods, water saving techniques) by humans, both individually and collectively: agroecosystems are obviously societal products. In fact, one should not forget that “a terroir is an ecological reality that lives and dies at the rhythm of the rural society with which it is identified” (Bertrand, 1968, as quoted in Rouvellac, 2013: 21 – my translation).

In any case, the biophysical dimension of terroir might matter even more for cannabis, its chemical makeup and its effects, than for most other crops, because the plant differs from most products meant for human consumption (such as coffee and tea) in that it is both a drug and a food (Stoa, 2018: 97). Terroir can therefore affect not only the polypharmaceutical and the psychoactive properties of cannabis but also the nutritional value of raw cannabis when ingested (leaves, stalks, stems, and seeds are a significant source of carbohydrates, protein, fat, water, vitamins, minerals, trace amounts of calcium, sodium, potassium, omega-3 fatty acids, terpenes, and phytocannabinoid acids such as THC and CBD) (Kyle, 2020: 34).

Terroir, landrace, and typicity

Following on from the above, it must be stressed that no terroir can be limited to its biophysical dimensions, if only because some of these dimensions are directly and indirectly determined by specific human cultural traits (including sensorial, gustatory, nutritional, religious preferences) and socio-technical processes (including culturally-determined choices of specific crops and varieties, crop cultivation and livestock production systems, production practices and techniques). Actually, the fact that terroirs are historical, cultural, and technical constructs that are as much natural as cultural (notwithstanding the fact that the concept of nature is also a cultural construct that is far from universal: see Descola, 2005) is indicated by another agricultural construct, that of the landrace, a cultigen that, like terroirs, owes as much to nature as to culture.

Indeed, while it is rarely, if ever, mentioned in terroir-focused studies, it can be safely postulated that a terroir best expresses itself through a local cultigen, and vice-versa. In fact, terroirs where crops such as landraces have developed at the interface between the ecological environment and the socio-cultural environment are what we could call archterroirs or terroir archetypes. Indeed, if typicity reveals terroirs, then the most singular terroirs are those whose products are issued from an autochthonous landrace. As stressed in a study combining agronomic, analytical and sensory approaches to document the terroir effect on aromas in grapes and wines, there are strong indications that “terroir expression at specific sites might be

maximized by choosing appropriate plant material in relation to soil and climate”, therefore acknowledging the ideal symbiosis that exists between terroir and local cultivars (Van Leeuwen *et al.*, 2020: 985).

While the interest for the concept of terroir is slowly growing in the world of Western cannabis aficionados and professionals, and while no cannabis terroir has yet been formally designated or delimited as such, cannabis landraces have been extremely popular and have proven commercially attractive (as testified by the dozens of alleged landraces mentioned on seed catalogues). This is most likely because the focus in the Global North has been more on cannabis varieties and hybrids than on the soil, the land, or terroirs, probably as a result of the century-old global prohibition of drugs that has encouraged crossbreeding and domestic outdoor and indoor cultivation, especially in the United States (Chouvy, 2019b). Illegality meant that land choice was restricted because of the risk of detection and repression: as a consequence, in the Global North, the industry has focused on the yield and potency of crops (predominantly indoors) rather than on the best soils, while in the Global South, large-scale commercial cultivation could only be undertaken (systematically outdoors) in favourable politico-territorial contexts (see below, and Chouvy, 2019c).

As a result, a growing interest for cannabis landraces has generated a lot of misinformation and confusion about what landraces actually are¹⁵, with the term landrace being most often used as a marketing argument with very little scientific rigor and very little commercial integrity. For instance, the sale of so-called landrace seeds by the unit or in very small lots, as is the rule in the modern seed business, does not take into account the fact that while F1 hybrids are true to type and can be sold by the unit, landraces are populations, not individual plants, and as such they require a minimum number of seeds to obtain (or, for that matter, conserve) the desired population. The exact number actually depends on “the frequency of the least common alleles or genotypes” (Allan *et al.*, 2020: 11) and also on the seeding rate but a bare minimum of 30 to 100 seeds is most likely needed to grow a cannabis landrace crop.

Rather unsurprisingly, the term landrace shares with that of terroir that it “encompasses a range of different concepts that have varied over time depending on prevailing trends” (Casañas *et al.*, 2017). Yet, what is most meaningful is what landraces share with terroirs in

¹⁵ Landraces are not, as is most often explained in the amateur cannabis-related literature, strains (never defined), wild varieties (or, worse, wild species), necessarily purebreds (whatever that means genetically and historically), very stable and with very few variations - if any - from one plant to another (actually the very opposite of what a landrace population is).

terms of their characteristics and first and foremost, again, that they both result from interactions between physical environmental factors and human factors. As explained by Casañas *et al.* (2017), “the term ‘landrace’ has generally been defined as a cultivated, genetically heterogeneous variety that has evolved in a certain ecogeographical area and is therefore adapted to the edaphic and climatic conditions and to its traditional management and uses.”

As such, landraces “consist of cultivated varieties that have evolved and may continue evolving, using conventional or modern breeding techniques, in traditional or new agricultural environments within a defined ecogeographical area and under the influence of the local human culture” (*ibid.*). As made clear throughout the landrace literature (see Zeven, 1998, for an extensive review), landraces differ from modern cultivars of the F1 hybrid type (and also from heirlooms¹⁶) in that they are populations and not individual plants: they are highly diverse populations that display a mixture of heterogeneous genotypes (Hawkes, 1983).

It is therefore difficult not to think of terroirs when considering landraces, and vice versa, as they are both defined in terms of environmental and human interactions and equilibrium, as well as of spatial limits. In fact, as stressed by Harlan in 1975, “different landraces are understood to differ in adaptation to soil type, time of seeding, date of maturity, height, nutritive value, use and other properties” and as such they are “balanced populations” that are “variable” because they are “in equilibrium with both environment and pathogens” and are “the result of millennia of natural and artificial selections” (Harlan, 1975: 618). Terroirs and landraces are also very much related in terms of spatial limits or scale, as hinted at by Barham when she writes, yet without making the link (like many, she focuses on terroir without addressing the topic of crop varieties, much less that of landraces): “This concept of terroir relates to a time of much less spatial mobility, when change occurred at a slower pace. Terroir products, in this interpretation, resulted from long occupation of the same area and represented the interplay of human ingenuity and curiosity with the natural givens of place.” (2003: 131).

In the same way that a terroir is characterised by the typicity of its products, a landrace is characterised by the phenotypic diversity of its population. This is actually another common characteristic shared by both terroirs and landraces: in the same way that a terroir product differs from a standardised product (for it implies variations within the type), a landrace differs from a standardised and true-to-type cultivar. In the end, typicity is a common characteristic of both

¹⁶ Populations of open-pollinated and unlisted (by the ICNCP) cultivars that are: more stable than landraces, not necessarily linked to a specific locality, used to be commercialised and/or maintained by gardeners and farmers before the development of modern F1 hybrids.

terroir products and landrace products. In fact, sometimes, the typicity of some terroir products, such as Moroccan hashish, depends at least as much on the cultivated cannabis variety (in Morocco, the *kif* landrace) than on the terroir: the switch from the *kif* landrace to modern hybrids since the mid-2000s has resulted in the production of a very different hashish that was of Moroccan provenance (where it is produced) and no longer of Moroccan origin (where it is from). While the Moroccan hashish made from the *kif* landrace could be considered a terroir product, due to its typicity, its origin, and its production environment (both physical and societal), the new Moroccan hashish could not. Interestingly, it was actually disliked by local producers and consumers, and by international consumers alike (Chouvy & Macfarlane, 2018; Chouvy, 2020; Chouvy, 2022).

While there are countless cannabis landraces across the world, many, if not most them, as is the case with landraces of other crops, are now at risk of disappearing because of introgression, neglect, or even repression (forced eradication). To draw up an exhaustive list of the world's cannabis landraces is impossible and listing the most important cannabis landraces, in terms of historical, cultural, and biodiversity significance, but also in terms of landrace status reliability (depending on the level of introgression from modern hybrids), would be challenging enough. Quite logically, considering their centuries-old cannabis traditions, Afghanistan (cultigens from Mazar-I-Sharif, Balkh, Ghazni, Kandahar, Kunar, Sheberghan, etc.), Pakistan, India (Malana, Parvati, Kullu, Kumaoni, Nanda Devi, Kashmir, Kerala, Manipur, Nagaland, etc.), and Nepal are maybe home to the largest number of landraces (reflecting quite logically the potential diversity of terroirs and the ancient cannabis culture in these countries). The rest of the world is, or was, full of no less famous landraces that included cultigens from Xinjiang (where most of the world's hashish came from between 1860 and 1934 when cannabis became illegal in China), Thailand (Mango, Chocolate), Laos, Cambodia, Indonesia (from Aceh), Lebanon (from the Bekaa Valley), Syria, Morocco (*kif*), Greece (Kalamata), South Africa (Durban Poison), Angola (Angola Roja), Malawi (Malawi Gold), Eswatini (Swazi Gold), Jamaica (Lamb's Bread), Colombia (Colombian Gold, Colombian Red), Mexico (Oaxacan Highland, Acapulco Gold), Panama (Panama Red), etc.

It should be noted that most cannabis landraces lack local names and that, as a consequence, most if not all of landrace names are exonyms that refer, in more or less creative ways, to their geographic origins (sometimes including a reference to the colour of the cannabis inflorescences). Sometimes, as for the Nanda Devi landrace that is grown in a handful of villages on the eastern flank of the Nanda Devi Sanctuary in the Kumaon Himalayas, (central

Uttarakhand, India), we get to learn about the origin of a name. In this case, we know from the collector who gave the Nanda Devi its name that, since Himalayan farmers usually have no name for their cultigens (for most villagers, cannabis is just *bhang*, a generic term that refers to the cannabis plant), he gave it a name so that it could be identified by other collectors. The Nanda Devi name seemed an obvious choice to him because “the Goddess (Devi, Nanda Devi, Durga, Kali, Shakti) plays a major role in the Kumaoni way of life and landscape”.¹⁷

It is difficult to say which landraces still exist or to what extent they have suffered from introgression as modern hybrids have recently spread quickly around the world. It seems that most of the famed landraces from the 1960s and 1970s¹⁸ have either disappeared, are seriously endangered, or have been altered by introgression or economic transformations and neglect. War and violence have also taken their toll on some famous landraces and on the cultures that produced them (Afghanistan, Lebanon, Mexico, Colombia, etc.). This is detrimental to biodiversity of course, but also to cultural diversity, and to the environment at large, for the cultivation of varieties that are adapted to their milieu requires little inputs and is dependable (something that has obvious economic and socio-political implications, most especially in the context of global climate change).

Indeed, landraces are valued in part because they are cultigens “with a high capacity to tolerate biotic and abiotic stress [prevalent in the area] resulting in a high yield stability and an intermediate yield level under a low input agricultural system” (Zeven, 1998: 137). Morocco, again, is an example of the threat posed to terroirs and landraces by modern hybrids through introgression and environmental impact as the Rif’s *kif* landrace has already been exposed to introgression and as the region’s limited water resources have been overused for the cultivation of the water-demanding hybrids. The drought-resistant *kif* variety therefore risks disappearing or being too altered by introgression by the time the region’s water resources are too low to keep cultivating hybrids (due to overuse and climate change) (Chouvy & Macfarlane, 2018).

Terroirs, landraces, and tradition

As is made clear by the aforementioned definitions of landraces, neither terroirs nor landraces should be considered in fixist terms or, worse, “musealized” through conservation

¹⁷ “Nanda Devi: Landraces and Tall Tales from the Himalayas”, Blog post from *The Real Seed Company*, 30 August 2018, <https://landrace.blog/2018/08/30/nanda-devi-and-tall-tales-from-the-himalayas/> (page visited on 6 January 2022).

¹⁸ When the so-called Hippie Trail that connected the world’s major cannabis-producing centres across Asia made the global success of Afghan, Indian, and Thai landraces and initiated the modern hybridisation era (Chouvy, 2019b).

approaches (Bauer, 2009; Casañas *et al.*, 2017) and, in the end, denied to continue developing and evolving throughout history and modernisation, which they inevitably do. As stressed by Bauer (2009: 86) in its archaeological approach of terroir, and of tradition and change, one has to acknowledge that the perception of change “may be skewed by a fetishization of the present, or the particular ‘past’ seen through the lens of the present”. By looking at long period of times, archaeology teaches us than “rather than being antithetical to *terroir*, migration and diffusion are assumed to continue to happen”, and that “cultural hybridities build on earlier expressions that are semiotically mediated through social interactions in the local context, so that new elements are constrained and shaped by the tradition of which they become a part” (Bauer, 2009: 89). Therefore, the evolution (i.e. modernisation) of landrace populations, of terroirs, and that of their products, must not be rejected (out of conservatism), whether it is caused or motivated by environmental and/or technical changes, or by cultural changes (in terms of taste, consumptions trends, ethics, ecology, etc.).

The preconception that “modernity” could wipe out “traditions” has actually had an impact on landrace conservation as *ex situ* conservation has long been favoured instead of *in situ* conservation as it was considered (particularly by Frankel, 1970) that no “steady state” was “possible in the population of primitive cultivars because of technological change in the farming systems that once produced them” (Brush, 1995: 346). The fear that “modern agriculture was a great leveller” that might prove “more powerful than other levellers in the past” has long existed despite the fact that “human communities simply do not achieve a homeostatic or climactic stage” that can be qualified as a “steady state” and that change has always taken place (Brush, 1995: 346, 347).

But as is now better understood and accepted, “the flux of genetic, human, biotic, and physical systems and their interaction make a steady state impossible to achieve or maintain” and, as a result, “change in this evolutionary context is continuous, and homeostasis is illusory” (Brush, 1995: 347). In the end, “while genetic erosion undoubtedly occurs with the replacement of landraces by modern cultivars, heterogeneity and resilience of farming systems in areas of crop diversity may allow for the maintenance of crop genetic resources, and not as an alternative to agricultural modernization or intensification” (*ibid.*). This is what has happened in Morocco when the fast spread of hybrids most recently (late 2010s) led to a revaluation of the local landrace and of its terroir product (Chouvy, 2020).

The cannabis world has clearly suffered and continues to suffer from such a fast double erosion process, with landraces, terroirs, and cannabis cultures being affected to various extents

by evolving traditions and various modernisation processes. Cannabis cultivation has long been confined to and within various cultures and traditions (India, Afghanistan, Mediterranean Europe, Sub-Saharan Africa, Jamaica, Latin America) throughout the world, based on different cultivation methods (rainfed or irrigated crops, seedless crops, etc.), different cannabis products (herbal cannabis, hashish, bhang, etc.) and production techniques (harvesting, drying, sieving, rubbing, etc.). It has actually resulted in a great diversity of landraces and terroirs. Yet, for cannabis as for other crops, the issue is often not that of change but of the speed at which it occurs. Indeed, the cannabis industry has been marked with a fast accelerating modernisation during the twentieth century, first with the advent of the global prohibition of certain drugs (1906), then with a progressive transformation since the 1960s (overlanders, hippies, first breeders, etc.), and finally with the regional and increasingly global development of the cannabis industry (mass production, indoor production, feminised and autoflowering varieties, success of therapeutic products) (Chouvy, 2019b).

Interestingly, it is through modernity that the world's many landraces have been revealed to the uninitiated, that they have been promoted, that their conservation has been valued and called for. As for cannabis terroirs, since our acceptance of the concept is more “modern” than “traditional”, they are only being discovered and valued now, as “traditions” (however reinvented and selectively defined) are valued in contrast to “modernity”. Of course, as neither landraces nor terroirs are trapped in traditions, and as modernity is all pervasive, cannabis cultivation and production keep evolving worldwide, for better or for worse. In fact, some cannabis end products that are largely considered to be traditional are of rather recent origin and are therefore the result of traditions that have evolved through modernisation: such is the case of the Moroccan hashish, whose production only started in the 1960s in a region and a culture that were historically involved with the production of *kif*, an older and more traditional cannabis end product (in Morocco, the term *kif* designates both the cannabis landrace and a smokeable mixture of cannabis and tobacco) (Chouvy, 2020).

By adopting a dynamic rather than a fixist perspective on both terroirs and landraces we acknowledge and accept that: terroir and their products are socially constructed (Bérard & Marchenay, 1995); terroirs can be perpetuated, ended, or even created (Laferté, 2012; Weber, 1983) (for traditions can also be invented and/or selected through specific narratives (Hobsbawm and Ranger, 1983; Zheng, 2019)); landraces can also be conserved, eradicated, imported/exported, or even created, with autochthonous and allochthonous landraces thriving best in their terroirs or origin or in ecologically-similar terroirs (Casañas *et al.*, 2017). Terroirs

and landraces, like the traditions they are constitutive of and issued from, are the products of ongoing processes of various historical lengths and depths, as indicated by archaeological insights on terroir and heritage conservation (Bauer, 2009). They are not static for they keep evolving, together, along with environmental and societal changes, in a symbiotic relationship. In the end, the notion of terroir (but also that of landrace) “offers a theory of how people and place, cultural tradition, and landscape ecology are mutually constituted over time” and reinterpreted selectively through specific narratives (Zheng, 2019: 283).

Conclusion: illegality and the specificity of cannabis terroirs and landraces

In the end, while cannabis terroirs share essential characteristics with other terroirs, they also clearly differ from most if not all other terroirs because of how they have developed, being issued from territories defined and delimited by illegality and the extent of state power. What is often overlooked is that terroirs tend to owe their existence as much to their geographic sites (physical attributes of the place) as to their geographic situations (surrounding features: existence of markets, historical and political factors, etc.). This is true even of the Bordeaux and Burgundy wine regions that owe their success at least as much to their sites than to their political and economic history (Enjalbert, 1953; Dion, 1959; Meloni, Swinnen, 2018), as they developed on the banks of large exoreic rivers and in close proximity to trading sea or fluvial ports, during very favourable historic times: as Roger Dion explained, “there are no great vineyards without great rivers” (Dion, 1959; Rouvellac, 2013: 24).

One could say, by comparison, that there are no great cannabis production areas without a sufficient deficit of politico-territorial control, often associated to, or due to, a certain degree of geographic and political isolation (Chouvy, 2019c). Geographic isolation has of course been favourable to the development and conservation of cannabis landraces, even if the fast spread of modern hybrids throughout the world since the 2000s, including into the most remote and isolated cannabis cultivation areas (including in Morocco’s Rif, India’s Parvati Valley and north-eastern states, etc.), has triggered genetic and cultural erosion (fast and sometimes brutal changes in socio-technical processes).

Even more so than for other crops, illegal cannabis cultivation is a spatial phenomenon with essential territorial dimensions. The extent of illegally cultivated areas in a given country is directly linked to the degree of – or lack of, for that matter – politico-territorial control exerted by the state and its apparatus. In fact, large-scale illegal drug crop cultivation, and notably of cannabis, can only take place according to three main scenarios: that of an ineffective war on

drugs; that of toleration, for various motives, of illegal drug plant cultivation by the state (which can amount to negotiated but effective control); and that of the militarily-challenged state that cannot exert full control over its territory (Chouvy, 2019c).

As a consequence, the global prohibition of drugs not only made the emergence of many of the world's potential cannabis terroirs impossible¹⁹ (where politico-territorial control by prohibitionist states was too strong), but it also hindered the development of existing terroirs (notably due to toleration being limited to specific areas), and often threatened the very existence of well-established terroirs (due to forced eradication for example). In the end, the cannabis cultivation, and, as a consequence, the cannabis terroirs, that we have inherited have been determined and delimited less by biological or environmental factors than by prohibition, the war on drugs, and deficits in politico-territorial control (cultural inclinations (Afghanistan, India, etc.) and prejudices (Western world) also played a significant role) (Chouvy, 2019c). Therefore, cannabis terroirs have long been, and most are still, illegal terroirs, and as such they have not benefited from the same reputation that other terroirs have enjoyed, for cannabis and growers have often been held in ill repute (racism, violence, disregard for subcultures, etc.) and for cultivation regions are often considered unsafe. It is easy to understand, then, why cannabis terroirs, being illegal, have not yet been acknowledged as terroirs.

While cannabis terroirs and landraces generally owe their existence to their development in remote and/or isolated areas marked by a deficit of politico-territorial control by states or authorities, they are now increasingly at risk of cultural and genetic erosion because of the same reasons. Indeed, from the 1990s on, the conservation of ecosystems and of their biodiversity was often thought possible by way of the economic valorisation of their exploited or unexploited resources, that is, by way of what has been termed market-based conservation. The idea was, and still is, that “improving local incentives to protect or conserve biodiversity hinges on locals benefiting from newly created resource markets” (Lybbert, 2002: 125). The ecosystems of cannabis-growing areas have not benefited from such market-based conservation schemes because cannabis growers have long been operating illegally and been subjected to repression rather than offered incentives. This is also because cannabis cultivation itself has long been targeted for eradication, not for expansion and improvement. In any case, classic conservation policies and actions would be difficult to implement in cannabis growing areas

¹⁹ In the same way that the Islamic conquests in the Mediterranean region but also the Anglo-French wars had a strong (but varied) impact on local vineyards and the European wine trade (Enjalbert, 1953; Meloni, Swinnen, 2018).

because “one of the most difficult situations for conservation is where state capacity to regulate is weak, major corporate organizations are absent, and the population does not have a strong culture of [...] conservation” (Jepson *et al.*, 2011: 482).

In the end, acknowledging and protecting cannabis terroirs and landraces matters at least as much as for other crops, because it favours the conservation and the promotion of biological, cultural, and sensorial (gustatory, etc.) diversity; because it gives typicity a chance in a consumer’s market mostly defined by standardisation and commoditisation (Charters *et al.*, 2017); because it promotes low-input and low-carbon farming systems; because it makes ecologically coherent farming systems possible; because it makes small farming (and actually also large-scale farming) more financially viable; and because it values and respects geohistorical specificities, traditions and heritages (landraces developed in isolated areas partly because of prohibition) without denying progress and economic development. The future of cannabis terroirs and landraces is as promising as that of other terroirs and landraces but depends on how the ongoing legalisation trend will unfold, especially in the Global South where small cannabis farming and genetic diversity could benefit or suffer from the new regional and global dynamics of the emerging legal cannabis industry.

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